THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1385.] LONDON, NOVEMBER 26, 1889. [41ST YEAR. Price 6d.

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Warranted Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"

As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

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DARTMOUTH, & BRIXHAM (TORBAY).

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PARKER & LESTER,

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THE ONLY MAKERS OF

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Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,

STOCKTON-ON-TEES,

Manufacturing Gas Engineers.

See Advertisement, p. 943.

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Portland Cement

MANUFACTURED BY

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ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.

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FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

The following Town Water-Works Supplies have been obtained by this System, viz. :—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

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HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C

Cool Bars.

Easy Clinkering.

Independent of Chimney Draught.

Without moving parts.

Requires no extra Space.

Cannot get out of order.

Moderate Cost.

Results Guaranteed.

BREEZE FURNACES

FOR STEAM RAISING AND RETORT FIRING.

By adopting this System, Gas-Works practically save the whole cost of Fuel.

Knowing the value of these Furnaces, **MELDRUM BROTHERS** are prepared to fit them up, **ON APPROVAL,** to Lancashire, Cornish, Egg-ended, or other Type of Steam-Boiler; also to Retort-Furnaces. Terms on application.

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MANUFACTURER OF

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PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

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ESTABLISHED OVER HALF A CENTURY.

Gas Engineers and Contractors for the Erection of Gas-Works.

MANUFACTURERS OF IMPROVED GAS-EXHAUSTING APPARATUS.

A Large Stock of Valves always on hand.

Lamp Columns; various patterns.

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Castings of every description.

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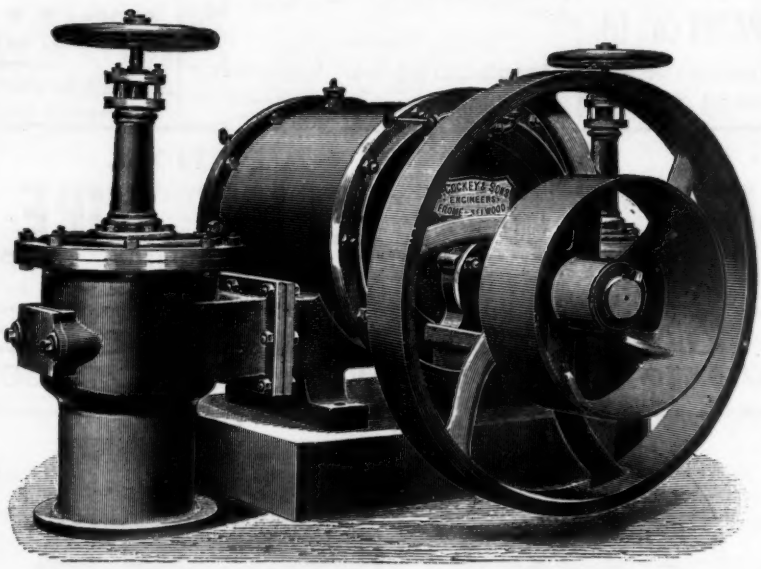

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OF EVERY DESCRIPTION
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All of the most approved Designs.

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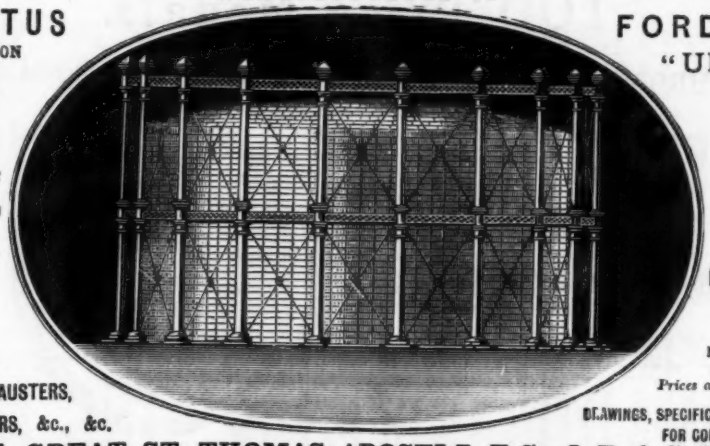

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SCRUBBER-
WASHER.
Numbers at work, giving excellent results.
No Motive Power Required.

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RETORT MOUTHPIECES
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NO LUTING REQUIRED.

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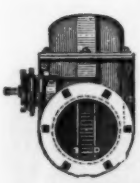
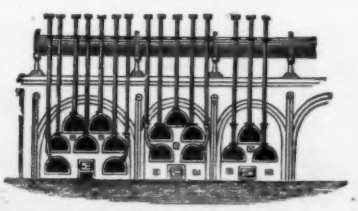
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.





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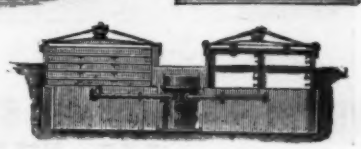

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100 Prize Medals.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.

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GAS-ENGINES
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FOR
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SEWAGE, &c., &c.

GAS-ENGINES
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FOR THE
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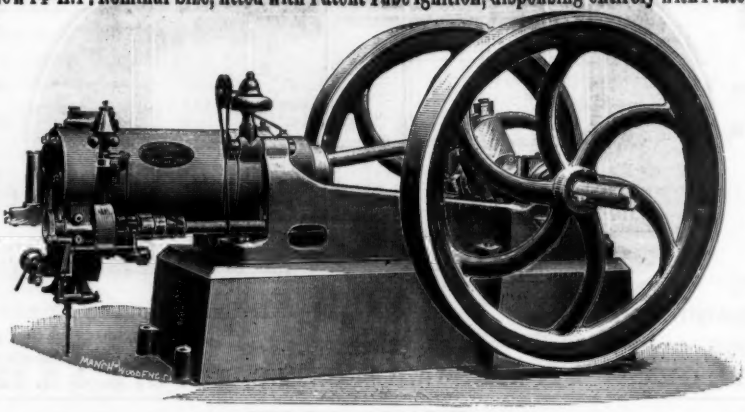

MADE in SIZES
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VERTICAL
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ENGINES
COMBINED
WITH
HOISTS, PUMPS,
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Largely used for
EXHAUSTING,
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Over 31,000 "OTTO" ENGINES are at work.

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GLAZED BRICKS AND PORCELAIN BATHS.

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Engineers, Ironfounders, and Contractors,
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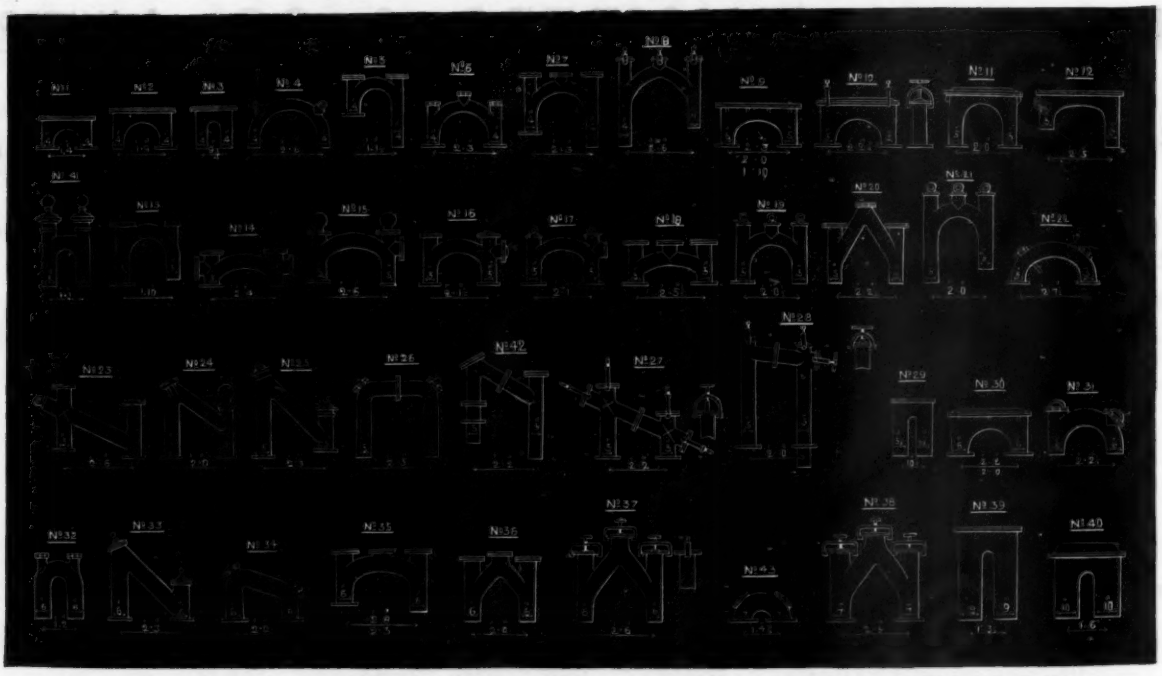

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Any of the above patterns can be made with either flange or spigot ends and with faced flanges or turned and bored plugs if required.

Designs Nos. 26, 27, 28, and 42 can be altered to any desired span without extra charge. Other variations by arrangement.

Patterns for special designs or spans made to order.

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For thirty years closely identified with the Gas Industry in North and South America, and having a wide personal and influential acquaintance with Gas Managers, is desirous of opening negotiations with gentlemen in Great Britain and on the Continent who own or control new Inventions or Systems applicable to Gas Purification, Gas Consumption, and the Utilization of Gas Residuals, Ammonia, Tar, and Sulphur. He refers by permission to

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By Her Majesty's Royal Letters Patent.

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The most successful and approved Apparatus known up to the present time.

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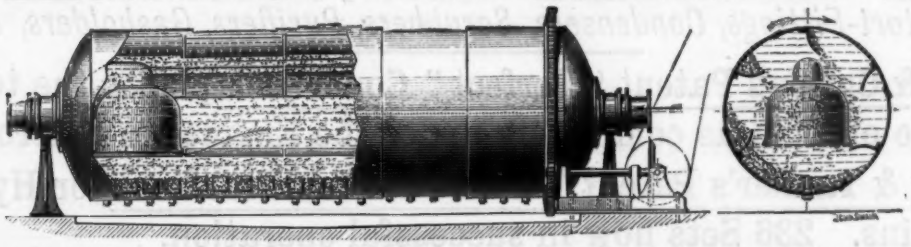
THE REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY. REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

GOLD MEDAL, INVENTIONS EXHIBITION, 1885.

Revolving Purifier Company, Limited,

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MAKE

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OF ALL FORMS & SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

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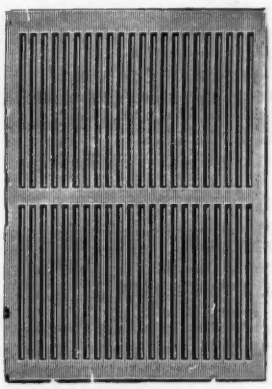

WOOD GRIDS FOR PURIFIERS

Made from any kind of Timber, of any Size or Shape, by trained Workmen and specially-designed Machinery.

Quick delivery and accuracy guaranteed.

BOARDS FOR SCRUBBERS

Cut and fitted upon the most successful system.

GRIDS FOR SULPHATE PLANTS.

Prices moderate. Inquiries solicited. Estimates free.

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SULPHATE OF AMMONIA PLANT.

MESSRS. CUTLER,

Are now giving special attention to

PLANT FOR THE MANUFACTURE OF SULPHATE OF AMMONIA,

And are prepared to supply Companies with the best and most efficient Apparatus on reasonable terms.

Plans, Specifications, and Prices on Application.

Retort-Fittings, Condensers, Scrubbers, Purifiers, Gasholders, &c.

Morris & Cutler's Patent "Perfect" Condenser places the temperature of the Gas completely under the Engineer's control.

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Cutler's Patent Freezing Preventer Apparatus for Gasholder Cups, Tanks, and Purifier Lutes.

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Mr. S. HERSEY, Managing-Director.

THE "NEW" PATENT

"Standard" Washer-Scrubber,

As supplied to and in course of construction for —

The Gaslight and Coke Company, Beckton Station.
" " Pimlico "
The South Metropolitan Gas Company, Vauxhall Station.
The Liverpool United Gas Company.
Barry and Cadoxton Gas Company.
Hitchin Gas Company.
Melbourne Gas Company.
Workington Corporation.
John Brown and Co., Limited, Atlas Steel Works, Sheffield.

Thoroughly extracts every grain of Ammonia and a large quantity of other Impurities from Gas.

Has been for many months in successful and satisfactory operation at The Gaslight and Coke Company's Station at **BECKTON,**

Resulting in a second order just received to fit up a Washer-Scrubber, of 2½ millions capacity, upon this new principle, at the same station. Other orders for these machines are in course of execution.

A very large amount of patronage has been accorded the "Standard" Washer-Scrubber, of which, up till now, **367** have been supplied, representing a daily make of **318,260,000** cubic feet of gas; but the advantages of the **"New Standard"** will be readily recognized, and its superiority over the present "Standard" may be briefly summarized as follows:—

1. The weight in motion is **only one-seventh** of that in the present machine.
2. It requires **only one-seventh** the power to drive; consequently effecting a large reduction in cost of Engine as well as in steam power.
3. **The Wear and Tear is enormously reduced,** as the Shaft has comparatively little weight to carry.
4. It has been found that the washing surfaces **keep perfectly clean** and free from deposit from end to end of the Machine.
5. It is so constructed that it forms a most powerful, effective, and complete system of purification, gives no pressure, and can be removed and replaced without trouble or injury.
6. The "New Standard," owing to the foregoing, can be supplied at **a large reduction in price.**

Engineers desirous of working Ammoniacal Liquor over and over again prior to leaving the "New Standard" can do so by the automatic and simple arrangement which forms part of this Patent.

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

Particulars will be furnished upon application to the above address.

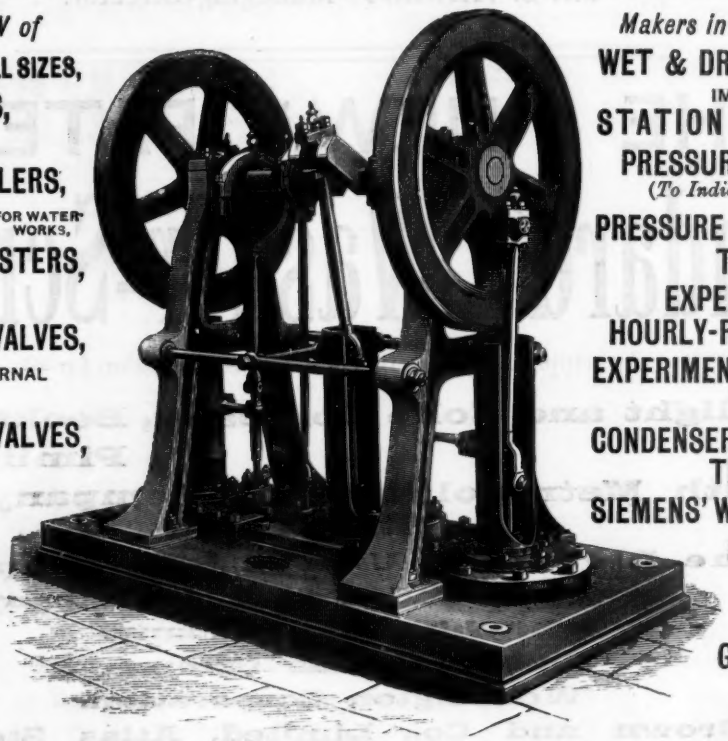
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

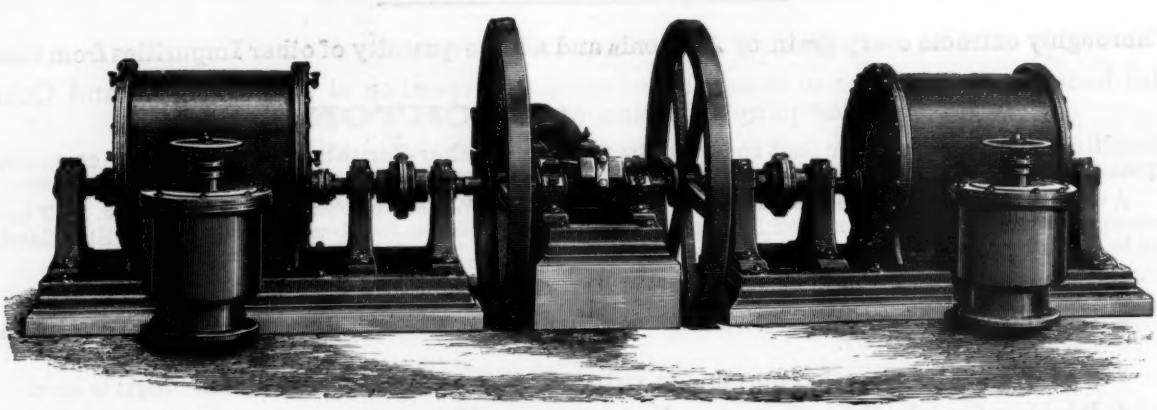
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS (*To Indicate Now Time*),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

IMPORTANT TO
GAS ENGINEERS AND GAS MANAGERS:

The most Economical, Reliable, and Handy Tool for Forge Work for

ENGINEERS, MACHINISTS, TOOL MAKERS, FITTERS, FORGERS, STAMPERS, COACH BUILDERS,

AND FOR USE IN

GAS-WORKS, SMITHIES, IRON-WORKS, COLLIERIES, &c., &c.,

IS

THE TANGYE GAS-HAMMER

(ROBSON & PINKNEY'S PATENTS)

As supplied to several of the principal Gas-Works.

TANGYES LIMITED
SOLE MAKERS.

As supplied to several of the principal Gas-Works.

Hand Gear. (*From Photos of the ½ cwt. size.*) Foot Gear.

THE above illustrations represent THE TANGYE GAS-HAMMER as now made. Since its introduction it has been greatly improved both in design and simplicity of working. It has also been constructed to work either with Hand Gear or with Foot Gear.

This—the first Gas-driven Forging Hammer introduced—was designed, and at first recommended only for use in cases where steam was not available or could only be employed at great expense, but the data given below, and which are founded upon reliable and sustained test and trial, demonstrate that the **GAS-HAMMER** may be economically used in competition with the Steam-Hammer, even in places where the price of gas is at its highest.

"*Since the appearance of our* ['*The Engineer*'] *notice, the Hammer has been in some respects re-modelled, and its remarkable economy placed altogether beyond a doubt. . . . The Hammer described is that known as the ¾ cwt. size, and has a cylinder of 7 in. diameter and 6½ in. stroke. The maximum blow is very nearly that which would be given by* **a weight of 3 cwt. falling through a height of 1 ft.**; *and this can be repeated at the rate of* **110** *blows per minute. . . . Extended test in practical smith work has demonstrated that over* **2500 of the heavier blows** *referred to above, can be given with* **one pennyworth of gas** *at half-a-crown per 1000 feet—i.e., the Birmingham price to small consumers—or over 4500 varying blows for the same consumption.*"—"**The Engineer,**" **Sept. 10, 1886.**

The Gas-Hammer dispenses with Boilers, Coals, Ashes, and Dirt necessitated by Steam-Hammers.

It is ready for work at any moment, day or night, and works as economically for a few minutes' spell as when in sustained operation.

PRICE LISTS AND FULL PARTICULARS ON APPLICATION.

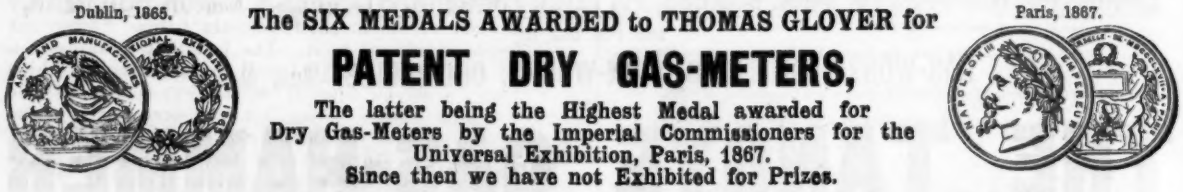
Tangyes Limited, CORNWALL WORKS, Birmingham.

London, Newcastle, Manchester, Glasgow, Paris, Sydney, Melbourne.

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



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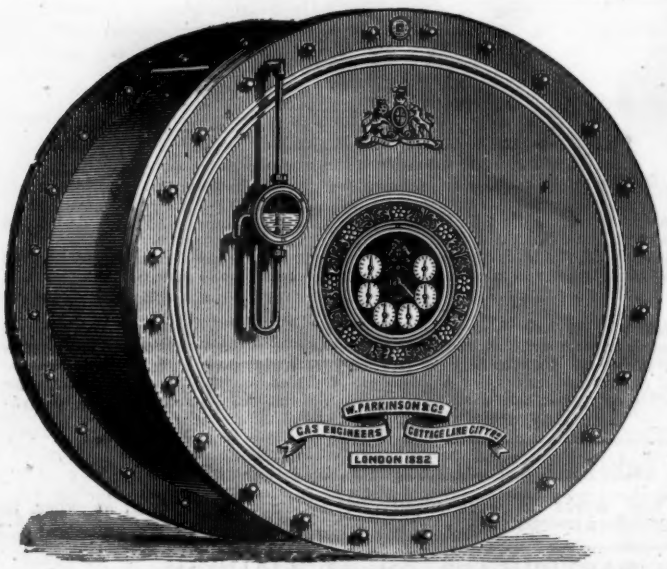

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 26, 1889.

THE SOUTH METROPOLITAN EXPERIMENT—SOCIALISM AND TRADES' UNIONISM.

THE South Metropolitan profit-sharing scheme is developing, as will be noticed from the letter of Mr. George Livesey published in our "Correspondence" columns to-day. The cause of the Company appears to be prevailing against the enmity and distrust with which their efforts have been met; but while the great body of retort-house hands keeps aloof, it cannot be said to have been won. If the scheme had been launched at another time, it would have had a better chance of being considered by the men on its merits; whereas now the influence of the Union has to be reckoned with. The Union is supposed to be for the benefit of the men who belong to it; but the worst of the spirit of Unionism is that it is disposed to condemn and reject all benefits that do not arise from itself. The Union executive is an intermediary between employers and employed, which undertakes to weigh and judge everything connected with the pay and working conditions of the latter; and while it naturally magnifies its own work, it as naturally depreciates everything that tends to make it appear superfluous. There cannot be a doubt that the managers of the Gas Workers' Union are intensely jealous of this profit-sharing scheme, which offers to confer upon the men affected by it a benefit that Unionism could never obtain for them. They would like to counsel their constituents to reject it altogether, as may be gathered from the snarling way in which their organs in the Press—the *Labour Elector* and the *Star*—have referred to it. The fact that upwards of a thousand men have already adopted the arrangement which gives them a direct interest in the prosperity of the Company is a wedge driven into the very heart of the Society, which cannot yet commit itself to directly advise its members to deprive themselves of the same benefit. It is not as if they had the excuse that renunciation of the Union was expected as a preliminary to adopting the scheme. The Company say nothing about the Union; and their offer is as open to Society men as to others. Consequently, although jealous of the idea, and fearful of its damaging their organization, the Union leaders in the South Metropolitan service both hanker after the bonus themselves and wish their friends to participate in it. The men who rule the Society from the other side of the water, and for the present have no interest in any such device, may counsel its rejection; but those who are personally affected have not the heart to do so. We believe that these considerations have so severely exercised the Union leaders, that they would be glad to find a bridge over which they could escape; and this has now been provided for them by Mr. Livesey's offer to abandon the "strike clause" in the agreement, to which they professed the greatest objection. There is now no obstacle in the way of the adoption of the scheme by the whole body of Union men; and we may therefore expect sooner or later to hear of their adhesion to it. We say this notwithstanding the reported rejection of the scheme at a mass meeting of Unionists held on Sunday. It is a question of time.

A meeting of delegates from the acceptors and of Directors and officers of the Company was held on Thursday last, when the men were given ample opportunity for stating their views of the whole scheme. We do not to-day publish any report of these proceedings; but it may be interesting to some of our readers to know that one was taken and printed, and may be had *gratis* on application to the Company. The object and working of the scheme were expounded by the Chairman; some legal points arising out of it were commented upon by Mr. Mark Knowles; and many workmen offered observations and asked questions, which were answered as fully as possible. The men are very naturally in doubt as to the extent of their own rights in the money set aside for them; and, as might be supposed, some of them want very free powers for handling it when and how they like. The Company wish the men to feel that the money is the man's own property in every sense; but at the same time they want to keep it from being frittered away or attached by creditors. Some of the men appear to think that the money is no more nor less than so much rise of wages, and would probably compound for all their prospective advantages under the scheme for 1s. a week or so more pay. It must be the care of the Company to correct this tendency. The Directors offer the men the power of drawing the interest on their apportionments yearly, as it accrues; but the "nest-egg" must remain for either three or five years, or some other undetermined period, in the Company's hands. If the men are wise, they will not touch it at all, and we should have preferred that they could have seen the advantage of leaving principal and interest to accumulate until they quitted the service, or experienced some great need. They have done without it so far; and if most of them had this extra money in their hands to-morrow, they would only spend it. We think the Company should discourage withdrawals by all possible and fair means, in the interest of the men themselves, if the plan is to work to the best advantage. It should, in fact, be as closely assimilated to the "deferred pay" system practised in the Army as can possibly be managed for the case of an industrial organization. The method of doing this will be found somehow, if the principle is only accepted by those whom it would most benefit.

It is diverting to mark the trouble of mind which this scheme is causing to some Socialists. It is undeniably

step in the direction that Socialists are supposed to prefer—the allocation to the workmen of a share in the profit resulting from his toil. The Socialistic doctrine, as we understand it, is that a workman has a right to more than his wage. No matter what the amount of the wage may be, it is held that the employer must make a profit on this outlay, or he would not continue it. The workman, in short, must in a general way be worth more than he costs. The problem is, therefore, to effect such a division of this product of labour that some of it shall belong to the workman himself, instead of the employer taking it all, as he does under the ordinary conditions of service for wages. We could understand a man who professes such a doctrine objecting to the South Metropolitan scheme that the workman's share is insufficient or wrongly computed. It is very funny, however, to see a professing Socialist objecting to the whole thing, because, for the sake of expediency, he has become a Trades' Unionist, and the scheme is independent of, if not in patent opposition to, Trades' Unionism. There is a good deal of human nature even in your most "advanced" Socialist. He is not above pocketing a principle or two when he thinks to serve a turn by so doing, as in the present instance. Socialism does not make much headway among the masses of the British labouring population. They have no ideas on the subject, like the more imaginative French or German artizan, who dreams of the Federation of Labour, and lashes himself into frenzy over the discussion of the injury inflicted on his order by the mere existence of other classes in the same community. The British workman, whether described by one who believes in him or otherwise, is recognized as a man of practical but limited aims. "Less work for more money" generally expresses his entire objects, whether sought for individually or in combination; and there is no Socialism in him worth talking about. It would be better, indeed, if the working man had a wider horizon. If he interested himself in matters actually affecting his health and pocket—such as the purity of his food and drink, the wholesomeness of his lodging, and so forth—he would be a power for good in the land. At present he cares for none of these things; leaving social reforms to those who have perhaps less spare time, and certainly less personal interest in the result. Limited as he is by nature and habit, therefore, it is not to be supposed that the apostles of Socialism, which altogether deals with the distant future, can arouse an answering chord in his bosom, or draw a sympathetic copper from his pocket. Consequently, the pure Socialist has to get down from his hobby and become identified with a Trades' Union, if he is to attract the people to himself. This being so, he is bound to despise what, if he were independent, he would welcome as a step in his own direction, when it does not come from his Union associates. So the *Labour Elector* has to sink Socialism in Trades' Unionism in order to get a sale; and the *Star* does the same—both "organs" accepting the dictation of Unionist agitators, and jeering at employers, whether gas directors or other traders, simply because they are employers, and ignoring all the benevolence for which many of those so vilified were recognized as bright examples long years before these wretched time-servers struggled into existence. The public at large, however, are not so easily befooled. Unless we are very greatly mistaken, it will be impossible to gain general sympathy and support for any class of workmen notoriously earning good wages for short hours of labour. The public undoubtedly sympathize with all workers condemned to toil more than twelve hours a day for a bare livelihood; but that is a very different thing from according support to every agitator who chooses for his own ends to keep well-paid workmen in a state of perpetual discontent.

THE SALFORD SENSATION.

It can well be understood how the announcement that the Salford Corporation have issued a writ against Mr. Ellis Lever, to recover a large sum of money supposed to have been laid out in the bribery and corruption of Samuel Hunter by this *soi-disant* paragon of commercial probity, has been a nine-days' wonder in the district where Hunter has played the part of dragon to Lever's St. George. It is desirable to exercise the most extreme caution in commenting upon this sensational declaration, as the *Manchester Guardian* justifiably calls it. We have not the faintest desire to anticipate the course of events, or to prejudice Mr. Lever's chance of a fair trial. If he can prove his innocence of the wrong-doing laid to his charge, we shall not be backward in congratulating him and condemning the action of the Salford Corporation. All the same, it is quite impossible for even those who have professed implicit faith in Mr. Lever's disinterestedness throughout his public performances since his triumph over the man who was once his friend and later his enemy, to deny that the very announcement of the present proceeding of the Salford Corporation looks worse for its object than would an ordinary action against another person. Those well-meaning, but rather simple people who took Mr. Lever at his own valuation throughout all these events, must feel uncommonly foolish now that they hear of such *primâ facie* evidence of his duplicity as warrants a public body in spending public money in legal proceedings against him. We at least can claim exemption from this category, for we have all along been most particularly careful to avoid falling into the at one time popular error of worshipping Mr. Lever as though he had been an angel of light. The local public seem inclined to jump to conclusions in regard to the matter, for they are already debating whether or not the £2000 for which the Corporation of Salford are suing Mr. Lever should be esteemed as part of the sum of £10,000 for which Hunter's peculations were to be commuted. All this is very painful, as well as petty, and induces one to ask impatiently whether there is a single high-minded as well as shrewd man in the whole Salford Corporation. If so, it is difficult to believe that he could remain silent while the grovellers round him are squabbling over this anticipated windfall, as though its amount were something to be thankful for, instead of its very appearance a proof of the degradation of their community. Is there one locally influential man to whom the honour and good repute of the borough of Salford are dearer than coin, and who has been wide-awake enough to avoid making himself foolish over the earlier stages of this miserable Hunter and Lever business? Let him disclose himself, and undertake the task of clearing off the whole scandalous affair, without care for compromises, compensations, or anything else but right and justice. One good man with brains in his head might do wonders for Salford at this juncture; but failing him, it will be increasingly evident that Salford is a huge blunder, as well as a blot upon the face of the land.

UNIONISM.

It is neither a thankful nor a hopeful thing for anybody to criticize the leaders of a Trades' Union. These strenuous persons have a short and easy way with any of their constituents who do not place themselves unreservedly in their hands, as many a poor Unionist by compulsion could testify if he dared; and now that Trades Union influence counts in political elections, not a few journalists truckle to the petty tyrants of the Executive Council by accepting the pretension that nobody can mean any good to the workman who does not unreservedly hold with Trades' Unionism. It is our duty, however, notwithstanding the hopelessness of the task, to utter a few words of warning to those who have taken the twopences of the gas workmen these many weeks, upon the pretence of working for their benefit. Some of them are apparently embarking on a course that will infallibly bring them to disaster, and the cause they profess into disrepute. Take this example from the last issue of the *Labour Elector*. A correspondent of this odd "organ" of Socialism and Trades' Unions, described as the Union Secretary at the Bow Common Gas-Works, writes to state how "greatly annoyed" the Union men at the station feel at having to work with nine men who have been "reasoned with" to join the Society, but in vain. Also there is a complaint that would be ludicrous if it were not so saddening, about a man, whose name is given, who "insulted" 40,000 men by tearing up his card before the Secretary's face, and irreverently declaring that he did not want either the card or the Union. So irate did this outbreak of independent spirit make the high and mighty official, that he threatens to begin "in earnest" to induce the recalcitrant nine to join the Society, and compel the solitary rebel to repent and return. This is a pretty state of things for a traditionally free country. The air "Britons "Never shall be Slaves" is presumably never played by a Trades' Union band. The fact is that terrorism of this kind is the support of all the branches of the Gas Workers' Union, with the exception of a very few. The leaders know how precarious is their hold of the men, and will not allow the slightest manifestation of independence. The idea of secret voting is very repugnant to these self-elected rulers; and if the Trades' Unionists could have their way in all things to-morrow, voting by ballot in all political elections would be entirely abolished, provided that they could be permitted to station a sufficiently strong "delegation" at every one of the polling-places. The Gas Workers' Union

is, however, in danger from other causes of disruption besides its reliance on methods of government apparently of Fenian origin. The rulers have made a great mistake in not confining it to the men for whom it was started. Mr. Thorne, the General Secretary, has been inspired by the ambition of making this the biggest labour organization in existence; and with this view, not even the street-sweeper who would consent to pay his twopences regularly has been turned away. The twopences have doubtless been acceptable to a treasury not particularly strong; but sooner or later these miscellaneous subscribers will either want some return for their money or will drop out of the Union, having perhaps mixed sufficiently with gas workmen to learn how well these are paid, and to envy their conditions. Strive as he may, Mr. Thorne will never create a Universal League of Labour on the basis of the Gas Workers' Union. The experiment has been tried before by better men under more favouring auspices, and has failed, as it will again, from the incompatibility of the interests sought to be combined.

THE VALUE OF COKE AND COAL.

The recent phenomenal rise in the value of coals has been made the most of by the newspapers and public men who opposed the removal of the London Coal Dues. "Here," they cry, "is a proof of what we said while the subject was "under discussion. London administrators have relinquished "a splendid revenue, and coal is dearer instead of cheaper." It is difficult to argue patiently with people who talk in this way; but it must be done, if not for their sakes, for the benefit of those who might be inclined to give heed to them. It should be sufficient answer to point to the fact that the advance in the price of coal has been at the pit's mouth, and not merely in London, in order to prove that the attempt to connect the rise in cost with the abolition of a coal duty in London is absurd. Yet notwithstanding the absurdity, the statement will doubtless continue to be circulated by those whose purpose it happens to serve. There would be more reason in the argument that if the actual rise in the value of coal could have been foreseen, it would have supplied one of the strongest reasons for removing the artificial impost which could only be expected to make matters so much the worse for the consumer. The coal duty has been removed—or rather modified—and the price of coal has risen instead of fallen, as it ought to have done. That is the argument of those who wanted to retain the dues; but it can be met by asking what would have been the consequence if the remission, partial as it was, had not taken place? Simply that coal would now have been still dearer, and a hard winter would have been yet harder for the poor. Trade has improved all round; but there are many miserable men, women, and children to whom such a remark is meaningless—with whom trade, such as it is, is never anything else than bad. An increase in the cost of fuel is a bitter thing in their experience. Fortunately these poor people are not wholly dependent upon the chandler's shop for the means of keeping body and soul together during the dark and chilly days that lie immediately before us. There are gas-works in every town, and here they can obtain a fair weight of clean fuel at a cheaper rate than anywhere else. Much has been published in the newspapers of late regarding the alleged trickery of coal dealers. It is satisfactory to reflect that gas-works render poor consumers of fuel practically independent of all such knaves in a higher degree even than the well-to-do householder.

ANOTHER ILLUSION.

In the issue of the Journal for the 8th ult. there appeared an account of a visit of inspection to Willis's Rooms, St. James's, where an amazing "invention" for rendering open coal fires smokeless, by sprinkling some saline powder over the fuel, was at the time on view. Reference to this report will show very clearly what we thought of the whole thing. It is the way of promoters of schemes of this kind to invite "representatives of the Press" to view their initiatory proceedings, and then to carefully sift the notices that appear in the various newspapers; selecting those they like best for advertisement. Consequently, a glance over the collected extracts of press notices republished by these ingenious gentlemen usually gives a curious illustration of the catholicity of reporters. It is so in this case. We learnt at the time that a "Syndicate" was being formed for exploiting the grand notion of abolishing smoke by salting coal; and prodigious advertisements of the "compound" have recently been blazoned in most of the London newspapers. These advertisements set forth a long list of press notices, from which, of course, the Journal criticism is conspicuously absent. They have *The Times*, of course—that is very easy game. There is no more fun in exposing the puerility of the so-called science notes in *The Times* than in shooting barn-door fowls. It is more amusing to notice how the opinion of a writer in a sporting print, a fashion journal, or a fanciers' organ is dragged in on such occasions to support a project that journals served by experts competent to judge the matters in hand either condemn or ignore. It is very funny to read the recommendation of a smoke-preventing patent by the *Sporting Times*, or the *Horse Guards' Gazette*. If a tipster were to back up his attempts to "spot the winner" by a quotation from the *Ironmonger*, or the organ of the Army and Navy services to habitually defer to the opinions of the Editor of the *Shoe Dealers' Guide*, the most innocent-minded believer in the omniscience of newspaper men would experience a sense of incongruity. Yet this is the principle that company promoters habitually follow in choosing their press notices. It is amusing, but it is also sad; because if this kind of bait did not take, it would not be so generally used. The whole system of which the smokeless compound people are the latest practitioners, is a bitter comment on the gullibility of the British public.

Protecting Water-Pipes in Cold Weather.—A new cement, made by the Eagle Non-Conducting Cement Company, has been adopted in several large mansions; and is now, we understand, being used for coating the cold-water pipes in a house which is being erected at South Nutfield, near Redhill. The pipes are cased in wood and filled up with this cement; thus protecting them from frost. The cement can be applied to outside pipes exposed to the weather; and when coated with paint or black varnish, they are kept dry and proof against loss of heat. The material, therefore, possesses great advantage as compared with felting.

Manchester District Institution of Gas Engineers.—The eightieth quarterly meeting of the members of this Institution, which is to be held in the Memorial Hall, Albert Square, Manchester, next Saturday, under the presidency of Mr. T. Banbury Ball, of Rochdale, promises to be one of unusual interest. The routine business will include the election of the President for the ensuing year; and of Mr. David Swallow, Engineer of the Bradford Corporation Gas-Works, and of Mr. J. B. Fenwick, Manager of the Windermere Gas-Works, as members of the Institution. The subsequent proceedings will consist of the discussion of Mr. Haddock's paper on "Water Gas," read at the previous meeting (see *ante*, p. 450); and of the reading of a paper on "The Dinsmore Process," by Mr. Isaac Carr, of Widnes, and one on "The Utility of Water in Gas Manufacture," by Mr. Thos. Newbigging, C.E. In view of the interest being taken in the process which Mr. Carr is to describe to his colleagues, and in the following week to the Liverpool Section of the Society of Chemical Industry, there is every probability that a good number of the members of the Institution will avail themselves of the opportunity which will be afforded them of seeing the process in operation at Widnes prior to the meeting. After the business, the members and friends will, as usual, take tea together at the Victoria Hotel.

Earthwork and Masonry Dams.—At the meeting of the Liverpool Engineering Society last Wednesday week, Mr. G. Farren, M. Inst. C.E., read a very interesting paper on the "Stability of Earthwork and Masonry Dams." He commenced by saying that he had been induced to introduce the subject partly by the recent disaster at Johnstown, in Pennsylvania, and partly by the alarms manifested at Oswestry and Shrewsbury regarding the stability of the dam at Vyrnwy. He had also lately returned from a tour in France, during which he had visited the Furens, Ban, Roanne, and St. Chamond dams, which were among the largest and certainly the deepest in Europe. He saw the Johnstown catastrophe was led up to and prepared for by neglect; the dam having been abandoned by the State in 1858. It was 72 feet high and 900 feet long; and it formed a lake which held 480 million cubic feet of water, or one-fourth the size of the Vyrnwy. The dam became depressed in the middle, and the bye-wash, or outlet for the overflow water, choked; the contents of the lake consequently poured over the depression in the earthen dam, and wasted it until it was too weak to further resist the pressure, and was then swept away. Mr. Farren next described the Vyrnwy dam, comparing it with the old non-scientific dams and with the more modern French and American designs. The principal points of engineering interest in the latter were touched upon; and after enlarging upon the theoretical design of the Vyrnwy structure, and proving his deductions mathematically, he declared it to be theoretically and actually as safe throughout as human skill could make it. In conclusion, Mr. Farren proceeded to consider scientifically the merits of semi-circular dams, designs of several of which he exhibited. He said the difficulty about such dams was that engineers were without any formulæ for their construction, and that everything was purely experimental. Owing to the length of the paper, discussion thereon was postponed.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1028.)

The prevailing tendency during the past week was decidedly flat in every market; though it is hard to say why. Of course, the Brazilian revolution was calculated to unsettle; and there is always a certain degree of sympathy between all the principal departments. But after making all due allowance, the flatness remains still not wholly accounted for. However, the closing prices generally were not the worst of the week. The Gas Market has been in a very bad way; and a glance at our Stock and Share List will show a general lowering of quotations, which embraces undertakings of all descriptions and in nearly all parts of the globe. Notable exceptions are the bonds of Australia and America—localities which are not peculiarly exempt from electric competition, the anticipation of which is said to be the cause of the fall in price. From the official reports, there would seem to have been a good deal of business done in Gas during the week; but we cannot discover that much stock has really changed hands. Of course, there is always a certain amount of compulsory realization by executors going on—for gas shareholders die every week; and full advantage is, no doubt, taken of this to put the price offered as low as possible. On the other hand, the general public has not lately been buying as freely as usual, as many other markets have felt. But we happen to know that some corporations, managed by very good men of business, are now seizing the opportunity to invest funds in Gas. Of the undertakings which have receded in price, the most noticeable are the three Metropolitan Companies. Gaslight "A" has ranged between 246 and 240½; the last price being marked on Saturday. Not much was marked in the secured issues; but they are nearly all lower. South Metropolitans have been put down, though the actual prices at which business was marked showed no falling off. Commercials have suffered heavily, and most unreasonably. If there is any stock to be had at anything like the nominal figures, it ought to be worth snapping up. Of the Suburban and Provincial undertakings, Brentford and Bromley have fallen. Many of the Foreign division have gone the same way. Imperial Continental was down to 203-208 on Friday, but recovered 2 the next day. The Water Companies continue quite stagnant.

The daily operations were: Gas opened dull on Monday, and business was sluggish. Gaslight "A" fell 1½; Bahia, 1; and Monte Video, ¼. There was nothing to note on Tuesday, except that the selling price of Gaslight "A" was made 1 higher, for some occult reason. On Wednesday, the hostile tide again set in; and Gaslight "A" was lowered 2, and Imperial Continental fell 1½. On Thursday, there was a general reduction pretty well all round. Gaslight "A" receded 1; "C," "D," and "E," 3; "J," 2; and "H," 1. South Metropolitan "B" fell 1½; Commercial old and Imperial Continental, 2 each; Brentford old, 3; and Buenos Ayres and European, ½ each. Matters were quite as bad on Friday. Of the Gaslight debentures, the 4 per cents. fell 1½; 4½ per cent., 2; and 6 per cent., 4½. South Metropolitan "A" fell 5; and "B," 1. Commercial old and new fell 3 each; and debenture, 1. Brentford old and Imperial Continental fell 2 each; Bromley old, 1; and new, 2; and Bahia, 1. On Saturday Commercial new fell 2 more; but Imperial Continental recovered 2.

ELECTRIC LIGHTING MEMORANDA.

THE BOARD OF TRADE AND ELECTRIC LIGHTING ORDERS—AN AMERICAN VIEW OF ELECTRIC LIGHTING—THE ELECTRIC LIGHTING OF HASTINGS.

The number of applications to the Board of Trade for Provisional Orders and Licences under the Electric Lighting Act has increased since we last mentioned the subject; and it would not be at all surprising if it reached 500 by the end of the month, when the list must be closed for the year. The Department will therefore be busy for a few months in settling the terms of these authorizations. The work will be greatly simplified, however, by the routine character that has already been stamped upon these proceedings. The difficulty which the Department and the promoters of Electric Lighting Orders have most to fear is not a very obvious one at first sight, but is likely to give considerable trouble in matters of detail. It arises out of the fact that there has not been time for the gaining of experience in the working of a single Order or Licence yet issued by the Board of Trade. Not one of these statutory settlements of the conditions of an electric lighting enterprise has come under the strain of actual working for a long enough time to test its weak points, if any. Consequently, the so-called "Model Order" of the Board of Trade may be as full of pitfalls as a sieve is full of holes. Nobody has suffered as yet; but if there is any error it will be multiplied inadvertently in all the Orders now in preparation. That this is no fanciful dread may be shown by reference to the incident arising out of the Newcastle electric light schemes, where progress has been suspended in consequence of the discovery of a supposed flaw in the law relating to the reinstatement of the roadways after these have been broken up for laying electric mains. It is stated that the Corporation of Newcastle cannot find out how to proceed if the electric undertakers make default in repairing the roads they may have disturbed; and the Board of Trade cannot help them. We do not know precisely how the point has arisen, but if the usual sections of the Gas-Works Clauses Act, 1847, are incorporated, there should not be any difficulty about the matter. However this may be, the fact of any such trouble having arisen in this instance is enough to warrant anyone in declaring that a little more wear and tear is desirable before it can be ascertained whether the Model Order is deserving of indefinite multiplication.

An article in the *American Manufacturer* on the comparative cost and desirability of electricity and gas for lighting, does not inspire a reader with much confidence in thinking that the problems of electric lighting have really been satisfactorily solved in the United States, notwithstanding the extent to which American experience in this matter has been carried. The American writer believes, from all he has read, that "England is still struggling with the merely rudimentary problems of practical electric lighting;" and he instances the doubtful regard in which the arc lamp is held here on account of its unsteadiness and liability to sudden extinction—"faults whose remedies, *efficient enough for the purpose*, have in this country long ago been found." The italics are ours. They show the really crucial point of the question, which is whether what satisfies an American community will equally please an English town. The answer is notoriously in the negative. Except in a very few favoured and long-settled localities, an American city thoroughfare is very different to the high street of an English town; and the inhabitants of the latter would not endure the slipshod methods and happy-go-lucky performances that perforce content the dwellers in the former. On the point of the greater proportionate extension of electric lighting in the States as compared with Great Britain, the American writer admits that this is due to the cheapness of gas in this country, which is a greater hindrance than electricity has had to encounter in the States. He is wrong, however, in supposing that the cheapness of gas here is traceable to the supply being in the hands of municipal corporations. "Cities supplied from municipal gas plants for the most part get their gas at the very low rate of 2s. 6d. to 3s. 6d., or 54 to 78 cents, per 1000 cubic feet, and this is made the standard of comparison with electricity in all discussions on the subject. The comparison is obviously not a fair one, and will not be fair until the electrical plant also shows what it can do under municipal control." Our American contemporary should be informed that while its figures are quite correct, they do not represent what is esteemed as cheap gas in this country, and that not Corporations but Companies sell the cheapest and best gas, with which the electric light interest has to reckon. Gas in London at 2s. 3d. per 1000 cubic feet, and in Newcastle, Sheffield, Plymouth, and other places at less, is a greater obstacle to electricians than the fact of some corporations, chiefly in the centre and north of England, and in Scotland, having control of gas-works. The most instructive part of the article is the portion dealing with the cost of electric lighting in America, which shows that neither incandescent nor arc lamps differ much in cost of working in the two countries. The Westinghouse Company have 27,000 incandescent lamps going in Pittsburg, at an average rate by meter of 0·6 cent per hour, which is very little under the prospective and actual London rates. It is the same with arc lighting. If the American companies had to put their wires underground and do their work under the conditions that apply to an English concern of the same kind, they would have to charge the same rates, and would admittedly find a difficulty in keeping afloat. It is extremely doubtful, indeed, whether any of them now make a profit worth talking about out of lighting alone. As with us, those that sell plant and undertake internal fitting make a little money; but lighting by itself does not pay.

Although there is an Electric Lighting Company at Hastings, the Corporation do not seem to be quite satisfied with the work done by this concern, and intend to supply the lighting of the seafront of the town from plant of their own, for which they propose to apply for a Provisional Order. It is rather a peculiar arrangement, because the Electric Lighting Company are also before the Board of Trade; but the idea apparently is to confine them to private lighting, while the Local Authority undertake the lighting of the principal promenade. How the matter will work out in practice is not for us to prophesy; but it is at least open to anyone to remark that the statement on which the sanction of the Town Council has been obtained for the scheme is of a very questionable character. The cost of the gas lighting has been exaggerated in order to make the proposed substitution of electric lamps appear less extravagant by comparison, and the latter are to be put 100 yards apart to save expense. Moreover, the estimated cost of supplying these has been "cooked" by making it appear that the steam power can be obtained somehow in connection with the working of the destructor which consumes the town's garbage. What a magnificent opening is here for a leading article in the style of the *Daily Telegraph!* Only think what a smart writer could do with the antithetical conjunction of garbage destruction with the production of the most brilliant, purest light, &c., that modern science has placed at the disposal of a community! The old saw of "*Ex fumo dare lucem*" would need a gloss to fit it to the new combination. It is a pity to spoil such a pretty idea, but the truth must be told; and this is that no such mixture of sanitary appliances and illuminating plant can be hopefully worked in Hastings or anywhere else. If the Hastings Corporation once get committed to their proposed electric lighting venture, they will be lucky if they escape with double the expenditure which they now seem to contemplate.

The Directors of the Alexandria Water Company, Limited, have declared a dividend at the rate of 2½ per cent. for the half year ended Sept. 30 last, free of income-tax.

THE ACTION AGAINST MR. ELLIS LEVER.

(From our Manchester Correspondent.)

Salford is the town of surprises; and the fact that it is impossible to imagine what will happen next, may have something to do with the widespread interest which the announcement of the action against Mr. Ellis Lever has excited. The Corporation and the Gas Committee were both praised and blamed for the course pursued in the issue of the writ, until it transpired one day last week that neither the Gas Committee nor the Corporation was responsible for that proceeding. The Town Clerk is, it now appears, master of the situation. He has initiated the proceedings; and though the writ is necessarily taken out in the name of "the Mayor, Aldermen, and Burgesses," the fact seems to be that few, if any, members of the Corporation knew anything about the intended proceedings until the news that they were commenced became public property through the medium of the press. The Town Clerk could not, however, very well act in so important a matter as this without some authority. This he derives from a general order of the Consultative Committee—the body responsible for what has been styled the "Hunter compact"—to take proceedings against certain contractors named by Hunter. One result of the secrecy observed as to the terms of the understanding between Hunter and the Committee is that no one ever suspected that Mr. Lever was one of these contractors. Still more remarkable is the fact that, if the action is successful, the Corporation will not benefit; for the money recovered will form part of the £10,000 which Hunter was stated to have arranged to pay. Not unnaturally, those who have been conspicuous by their opposition to the late Gas Manager, object to the Corporation fighting the battle on his behalf; and there is a prospect of the exceedingly lively "scenes" which have lent animation, if not dignity, to the proceedings of the Council being renewed over this point.

In the meantime, there are numerous rumours and endless discussions as to the position which events are likely to assume. It is said, for instance, that the evidence to be produced at the forthcoming trial does not rest entirely on what Hunter himself may say. Nor is it, if rumour may be trusted, based on the testimony of men formerly in Mr. Lever's employ. There is said to be documentary evidence, in the writing of Mr. Lever himself, which will be produced. If so, one may be forgiven for wondering why it has been so long withheld. Hunter's position was so exceedingly serious, and the punishment meted out to him was so severe, that it is hardly conceivable that he should have held back that which would have involved his opponent in ruin in effect as great as that which overwhelmed himself. In some quarters, the action is bluntly denounced as a mere dodge—"a red herring drawn across the trail," to divert attention from the neglect of the Corporation to sue some other men who are known to have bribed Hunter. Another view taken of the matter is that Hunter is seeking to reimburse himself for the amount of restitution he has been induced or compelled to make; and that in the end he may get back more than the £10,000 he has parted with. Neither of these opinions is, however, general. There is a very natural belief that if Mr. Ellis Lever has himself been amongst the bribers, he ought to be made to suffer the penalty and reap the odium which will attach in an especial sense to him.

That the present action will be the end of the matter, no one believes. Should it be successful, there will be a revulsion of feeling hitherto displayed against Hunter; while successful or not, the reopening of the inquiry will lead to other and perhaps unexpected results. As the *Manchester Guardian* puts it: "It will not be easy to open the door ajar; the public will perhaps insist that this time it shall be thrown wide open." We have heard little of late of the petition for a Commission of Inquiry; but this action will give a fresh incentive to those who are moving in that direction. A Wigan paper—and Wigan still takes some little interest in Salford gas affairs—suggests that the Government should appoint a court with a roving commission. It is certainly difficult to see where the matter will end.

THE VAN STEENBERGH WATER-GAS APPARATUS AT KNIGHTSBRIDGE.

There is nothing more remarkable in the later history of gas engineering in Great Britain than the sudden impetus that the study of water-gas systems has recently received from a combination of circumstances. A good deal of our space has been devoted of late to this subject, and there is every appearance of a continuance of these discussions. As we have already remarked, water gas has been forced into prominence during the last month or two by a variety of influences. We do not include in these Mr. Samson Fox's advertisement of the idea; for it is nearer the truth to say that the operations of the British Water Gas Syndicate have left the matter very much where it was before, in the estimation of practical men. Rather would we ascribe the undeniable alteration of British gas engineering opinion in this regard to the reports brought home by travellers as to the increasing popularity of the gas in North America, and of the advantages of the most improved water-gas processes. These statements, working in conjunction with increasing labour troubles and rising prices of iron, &c., at home, have induced English gas engineers to think that there may be more in water gas than they have hitherto found reason to believe. Our recently-published description of the Loomis process afforded the first evidence to show that water gas had at last entered into the scope of British gas politics. This system was described as adapted primarily for the production of fuel gas for factories; and, in bespeaking attention to it, we promised to give as much prominence to any other scheme of the kind similarly brought under our notice. This week we have pleasure in fulfilling that promise by describing in general terms an experimental installation of the Van Steenbergh system that has just been completed at Humphrey's Hall, Knightsbridge. A fuller description of this interesting plant, with drawings, will be published on a future occasion.

For the present, we must content ourselves with a few preliminary notes of what has been done by way of turning a hall in the West-end of London into a gas-works. Everything has been managed so quietly, that when we were invited by Professor Vivian B. Lewes (who has been engaged to report upon the process) to visit Humphrey's Hall for the purpose of seeing a water-gas plant, we had not the faintest idea of what was on view at such an unlikely spot for a gas-works, and the name of the inventor was not familiar in connection with American water-gas engineering. The Lowe system and its affiliated processes bulk so largely in the contemporary literature of water-gas making, that one seldom hears of any other, unless it has made itself known, like the Loomis down-draught process, by reason of some salient peculiarity. The principle of the Van Steenbergh apparatus cannot be appreciated without a short preliminary statement of the main lines of the development of American water-gas systems. The first successful process of the kind was the Tessié du Motay, which had several imitators, all characterized by taking the hydrogen and carbonic oxide gases directly from the generator through the washer, &c., to a gasholder, whence they were brought back to a carburetter, which entailed a re-heating stage to fix the product. Mr. Lowe improved on this by putting the carburetter immediately after the generator, so that the gas was made and carburetted at one heat; all other stages following these instead of separating them. The economy of this alteration is obvious; and the Lowe process had for many years a great vogue. Imitators, of course, arose; but by a recent decision of a United States Court, Mr. Lowe's is declared to be the controlling patent of all water-gas processes in which the carburetting or fixing chamber, or superheater, is annexed to the gas generator. This judgment affects the Granger, Flannery, Springer, and several other well-known patterns of water-gas plant. Mr. B. Van Steenbergh, however, claims to have overcome the difficulty of the Lowe patent by combining the superheater with the generator in one vessel, from which he claims various advantages. Whatever may be the net value of these supposed benefits, the difference between the Van Steenbergh and the Lowe types of water-gas plants is not so obvious that an observer at a distance, like ourselves, would pick the former out as something noteworthy among the score or more of rival arrangements all presenting a strong family likeness, yet all claimed to be pre-eminent for some speciality of design or manner of working.

If anyone in the English gas engineering world has hitherto been ignorant of the Van Steenbergh device, there is an evident determination on the part of Mr. Van Steenbergh himself and his friends, that this state of things shall cease. They have installed their plant in the most complete, not to say sumptuous fashion. It is no toy apparatus that they have erected at Humphrey's Hall, but a working plant capable of producing 130,000 cubic feet of gas daily, which is to be used in lighting the large block of buildings in which the hall is situated, and its *façade* on the Knightsbridge Road. The Hall is filled with all the paraphernalia of a gas-works designed after the most approved fashion, with very much more room round and about the different pieces of apparatus than there is in many works out-of-doors. The first object that strikes the eye on entering is the generator, standing like an elongated coffee-pot boiler immediately underneath the skylight, through which its discharge-pipe for the producer gas made during the process of "blowing-up" conveniently protrudes. At the far end of the hall is a gasholder (in its tank), capable of holding 10,000 cubic feet; and round the walls are ranged a boiler, meter, purifier, condenser, and scrubber. There is an exhauster and a blower, with the necessary engine, and a photometer and gas-testing room. Connections are made from the testing-room to different parts of the apparatus, and everything is so fairly laid open to Professor Lewes for the purpose of his chemical investigation, that he ought to be able to give the world more information relating to water gas from this really splendid plant than has ever been available before. We believe, moreover, that Professor Lewes is fully aware of the value of his opportunity in this respect, and intends to take the utmost advantage of it.

The Van Steenbergh gas generator at Knightsbridge is about 36 inches in internal diameter and 12 feet high. At the bottom is the ash-pan, capable of being closed by an air-tight door. Into this is delivered the air-blast during the period of "blowing up," and the supply of superheated steam when gas is to be made. There is no attempt in this plant, such as could be devised in a gas-works, for utilizing the waste heat of the producer gas in raising and superheating steam for the engine and generator. This is, therefore, so much to the disadvantage of the apparatus, and must be allowed for in judging its efficiency. The mass of fuel in the generator rests upon an ingeniously-planned rocking fire-grate, which can be worked from outside without interfering with the operation of the vessel, and is stated to keep the bars particularly free from clinker and ash. Round the circumference of the generator, at a level corresponding to two-thirds of the height of the fuel inside, are disposed four oil-supply pipes controlled by valves, for delivering the necessary hydrocarbon for carburetting the water gas as made. The upper third of the

generator is practically void, except for a transverse tile or two, and is intended to fulfil the purpose of a hot chamber for fixing the mixture of gases. On the top of the generator are two openings—one covered with a coal hopper on the powder-flask pattern, and the other capable of being closed by a gas-tight lid while making gas. The chimney is not in actual contact with the generator, but is suspended over it with an open cone at the lower edge to collect the gases as blown off. The method of working is simple. Supposing the fuel to be at the right height in the generator, the ash-pan is sealed, and the air-blast turned on for a few minutes, until the whole of the upper part of the vessel—fuel, sides, and top of the empty upper third—is at a white heat. The air-blast is then stopped, the top lid closed, and superheated steam and naphtha are turned into the generator at their respective places of admission. Simultaneously the exhauster is worked at a great speed, because the gas comes over very freely at first. The gas is washed, condensed, and purified, and stored in the holder in the usual way. The chief impurities appear to be carbonic acid and a little sulphur; if the gas making is properly done, there is little or no fluid deposit.

The question that now arises is, of course, that of the superiority of the Van Steenbergh to other water-gas processes; and this question we have no means of answering until Professor Lewes has presented his report. He will take account of what goes into and comes out of the generator, and it will then be known how economically or otherwise the system works. It is claimed—but we repeat the claim under all possible reserve—that, with the most economical size of his plant, Mr. Van Steenbergh can make 1000 cubic feet of 22-candle gas with a consumption of 25 lbs. of anthracite coal and 2½ gallons of naphtha. While mentioning this statement, we think it only right to remark that the average performance of water-gas plants in the United States is understood to be from 40 to 50 lbs. of coal and 4 to 5 gallons of oil per 1000 cubic feet of gas of 25 to 27 candle power. Why or how Mr. Van Steenbergh can do so much better than this is not for us to say. We can, however, give him credit for frankness in allowing his claims to be fully tested.

It is the object of the capitalists who have taken up the Van Steenbergh apparatus to place their plant in British gas-works. They claim to be able to put 22-candle gas into the holder, including everything, for about 1s. 2d. per 1000 cubic feet. It will, of course, have to be proved that this is a fair deduction from the performance of the apparatus and the prime cost of the raw materials. At present Mr. Van Steenbergh uses anthracite coal for making his gas; but this must be altered if the process is to recommend itself to gas companies, who will never buy Welsh coal while they have coke to sell. There is no reason to suppose that the plant will not work as well with coke as with coal; and it must do so if it is to be generally adopted in British gas-works. Perhaps the inventor does not yet realize this necessity; but it is clear that if water gas is to make its way here, it will be as a winter auxiliary, when many gas managers have more coke than they always know what to do with. Another point to be mentioned in regard to this particular description of plant is a very serious one. It is certain that the recent expansion in the water-gas manufacture of the States is due to the adoption of cheap Lima crude oil as the carburetting material. While naphtha, or rectified petroleum under any name, was the only carburetting material, water gas made comparatively small headway. While this condition prevailed, there was a sharp line of distinction between the water-gas and the coal-gas interests. Since Lima crude oil has been used, instead of the more costly fluids, a gradual process of fusion of the two systems of gas making has set in; because many coal-gas manufacturers have found it as cheap and convenient to make water gas as their traditional product. Consequently, we have been led to regard Lima crude oil as the key of the later water-gas developments. Mr. Van Steenbergh will have nothing to do with crude oils, however, but clings to the necessarily more costly naphtha. This is a preference which he will have to justify by results. Again, his generator is fundamentally different from those employed when crude oil is dealt with. It is a maxim with most makers of water-gas plant that the fluid hydrocarbon should be gasified in a fixing-chamber filled with refractory material, because it would be destroyed to a great extent if put into the live fuel itself. This latter, however, is precisely what Mr. Van Steenbergh proposes to do. There is such a striking difference between the large superheaters of the modern Lowe and Springer or Flannery arrangements, and the small chamber which Mr. Van Steenbergh devotes to the same purpose, that one easily perceives that there must be some good reason for it. This reason is to be found in the natures of the hydrocarbon to be dealt with in the two cases. The large superheaters are for dealing with heavy, crude oil, while the small chamber suffices for the more tractable and cleaner rectified products. Is there any reason for the further difference that Mr. Van Steenbergh puts his oil into the body of the fuel, and the others do not? Is this a wasteful proceeding or the reverse? Has Mr. Van Steenbergh any sufficient reason for following the plan beyond that of circumventing the Lowe patent?

From the fact that we have asked so many questions and named so many qualifying considerations, it is to be inferred that we by no means accept the inventor's own estimate of his system. At the same time, the experimental demonstration to which he has submitted at Knightsbridge is so boldly conceived, and carried out with such confident lavishness, that one can but respect people who back up their cause in so striking a way. At any rate, the venture is eminently worth attention.

ELECTRIC LIGHTING LAW.*

The useful work of Messrs. Bower and Webb, which we reviewed upon its first appearance soon after the passing of the Electric Lighting Act, 1882, has been found worthy of a second edition, to bring it up to date. The first edition was, of course, rendered obsolete by the later alterations of the law, and by the development of the practice of the Board of Trade with regard to statutory electric lighting undertakings. When the first edition was written, it was impossible to foretell what would be the course of this development; but Messrs. Bower and Webb tried to help their readers to an opinion by reprinting the evidence on which the Select Committee proceeded in settling the Act. Everybody now knows what happened. The Act killed off all the first brood of speculative electric lighting companies, and for a time constituted a very Glacial Period for such enterprises. When the work of destruction was done, and the public had learnt by sad experience that the sole function of an electric lighting company should not be the paying of stupendous prices for questionable patents, a movement arose, and took shape, for giving capital more inducement to embark in practical lighting than was offered under the original Act. So the Act of 1888 was passed, prolonging the free life of statutory undertakings from 21 to 42 years, and making other concessions to *bonâ fide* undertakers. The effect of the alteration was immediate, in the revival of electric lighting speculations—some doubtless genuine, but many, unfortunately, repeating the experience of 1882-3, when all the local authorities of the country were frightened out of their senses by notices issued by roving speculators, who scattered their disturbing communications broadcast over the land. So it is now; and therefore, as "it is an ill wind that blows nobody any good," the present revival of the interest of clerks and members of local authorities in electric lighting law, due to the random notices issued by the later race of speculators in this line, may well redound to the profit of Messrs. Bower and Webb, whose carefully-written handbook practically exhausts the subject. Laymen, as well as lawyers, may learn from it; for the authors, in a most elaborate preface, take the reader as it were by the hand, and lead him to a clear comprehension of the purpose of their work—repeating the performance with greater detail in a lengthy introduction, which leaves nothing to be added by way of comment. We must, however, notice one remark which so clearly explains the position of private suppliers of electricity—and we may add of gas, water, or anything else requiring pipes, wires, &c., for its conveyance and delivery, as contrasted with, or antecedent to all statutory undertakers ("monopolists" in the popular idea)—that it may be recommended to the attentive study of people who are at all doubtful on this important point. Messrs. Bower and Webb say: "Of course, it was before 1882, and still is, open to any of the Queen's subjects to generate and supply electricity in his own premises, and use it himself, or, for the matter of that, supply it to other persons and places, provided that no injury to the property, convenience, or comfort of any other person or authority, or the public be thereby inflicted; and provided also that it be not necessary for that purpose to break up the public streets or interfere with any other of the public rights." Breaking up the public highways for purposes of private gain will be held by the Courts to be a nuisance, and will accordingly be restrained if complained of in the proper way. This introductory chapter is quite fresh, and discusses such modern points as Major Marindin's recommendations, and the general attitude of the Board of Trade towards proceedings by Bill, Licence, or Provisional Order for the current season. After the introduction comes the text of the Acts, amply annotated. The appendices contain the Board of Trade rules for applications for Licences and Orders; a "model form" of Order for a Metropolitan area, which is substantially the same as the form approved by the Board for the three recent provincial Orders issued for Swansea, Birmingham, and Liverpool; the regulations for the protection of the public safety, &c.; and there is a full index. The book is well printed in legible type, and can be unreservedly recommended to all interested in the subject of which it treats.

The negotiations between Mr. A. R. Binnie, the Water Engineer to the Bradford Corporation, and the Sub-Committee appointed by the Finance Committee to confer with him to ascertain whether, in view of his candidature for the position of Engineer to the London County Council, means could not be devised whereby his professional services could be retained till the completion of the projected new scheme of water-works for the borough, have proved abortive. After the conference, the Sub-Committee recommended that, conditional upon Mr. Binnie withdrawing his application, he should be appointed Chief Engineer to carry out the proposed Nidd Valley extension, and that in future he be entitled to act as a Consulting Engineer on his own account, but in no way in a manner inimical to the interest of the Corporation, and at all times with the approval of the Chairman and Deputy-Chairman of the Water Committee. This proposal was considered at a meeting of the Finance Committee last Tuesday, but did not meet with approval. Mr. Binnie was not willing to modify his terms, and the negotiations terminated.

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*"The Law Relating to Electric Lighting. Second Edition. Being the Electric Lighting Acts, 1882 and 1888, with a General Introduction, a Continuous Commentary, and Appendices, consisting of the Rules, Regulations, and Model Form of Provisional Order issued by the Board of Trade." By G. Spencer Bower, B.A., of the Inner Temple, Barrister-at-Law, and Walter Webb, Solicitor. London: Sampson Low, Marston, Searle, and Rivington, Limited; 1889.

Notes.

Wind Velocities at High Altitudes.

Advantage has been taken of the altitude of the Eiffel Tower at the Paris Exhibition for making meteorological observations; not the least important subject of study being the velocity of the wind at different stages. The instruments employed are "anemometer-cinémographes" constructed by MM. Richard Frères; one being fixed at a height of 303 metres above the ground, and the other, for the sake of comparison, on a turret of the central meteorological office, at a height of 21 metres above the ground, and at a horizontal distance of about 500 metres from the tower. The daily variations of the velocity of the wind, calculated for every month separately, absolutely follow the same law. The general mean of all the observations for the 101 days covered by the record, shows that the wind at the summit of the tower was about three times as strong as at the lower level. At stations near the ground, the daily variations of the velocity of the wind present a single minimum point at sunrise, and a single maximum at one hour after noon. At elevated stations, on the contrary, the diurnal variation of the velocity of the wind is sensibly reversed, as has been repeatedly observed at mountainous stations. It is very remarkable that this inversion is indicated even at a height relatively so insignificant as that of the Eiffel Tower. Here the minimum is about 10 a.m., and the maximum about 11 p.m.; the characteristic maximum of the lower regions about the middle of the day being hardly perceptible. Another important observation is that the velocity of the wind at a height of 300 metres is much greater than is ordinarily supposed. During 39 per cent. of the hours during which the Eiffel tower anemometer was working, the velocity of the wind exceeded 8 metres per second; and during 21 per cent. of the hours, it was more than 10 metres per second—and this, it must be remembered, was for the three finest months in the year.

High Steam-Engine Duty.

A remarkable performance is recorded in *Industries* as having been obtained at a test of Messrs. Hick, Hargreaves, and Co.'s patented system of compounding steam-engines and boilers, now in use at the Hartford Mills, Bolton. The peculiarity of the arrangement consists in the use of a high and a low pressure boiler, as well as of high and low pressure steam cylinders. The low-pressure boiler (which may be an old one unfit for heavy pressures) is made to serve as a receiver for the exhaust steam from the high-pressure cylinder, which is supplied in the ordinary way from the high-pressure boiler. The waste gases from this boiler are employed to heat the low-pressure boiler; and after the steam has been taken from this boiler to the low-pressure cylinder, it is condensed. As regards the boilers, the feed water is first warmed by passing through an economizer; and it is then passed through the low-pressure boiler into the high-pressure boiler, by means of a separate pump. It is thus only the high-pressure boiler which is directly heated by the furnace; the products of combustion being led round the low-pressure boiler, and finally utilized in heating the economizer. The mean indicated horse power of the engine fed by this system of boilers was 371 at the trial. The pressure of steam in the high-pressure boiler was 139 lbs. per square inch; and in the low-pressure boiler 15·5 lbs. per square inch. The temperature of the waste gases in the flue after passing the economizer was 251° Fahr. The evaporative duty of the coal was 8·2 lbs. of water per pound. The consumption of steam by the engine was 13·3 lbs. per indicated horse power; and the weight of fuel burnt was at the rate of 1·61 lbs. per indicated horse power per hour.

A Comparison of Steam and Gas Engines.

M. Hirsch delivered a lecture before the recent Congress of Applied Mechanics in Paris, in which he discussed the prospects of thermal engines. The foundation theory of thermo-dynamics states that the theoretical duty of a heat-engine between the same limits of temperature is independent of the intermediary body employed for the transference of the heat, be it steam, other vapour, gas, or anything else. Admitting this, M. Hirsch disputes certain consequences sought to be deduced from it. It has been said, for instance, that if it does not signify what intermediary fluid is used, it is unnecessary to look further than water for the best fluid, for this must always be the cheapest and most convenient. M. Hirsch's remarks, however, that it is a good steam-engine that shows a duty of an indicated horse power for a kilogramme of coal consumed in the boiler furnace, the calorific power of which is 8500 calories. But a cubic metre of coal gas, developing only 5300 calories, will do as much as this in a gas-engine. Wherefore, the thermal duty of the gas-engine is 50 per cent. better than that of the steam-engine. Moreover, the steam-engine must be a large and a very good one, or its duty will not be so high as the figure here credited to it; while, on the other hand, the gas-engine is a thing of yesterday, with its theory not yet fully made out, and probably susceptible of great improvements. Theoretically considered, of every 100 calories developed in the furnace of a steam-boiler by the combustion of coal, only 7·5 per cent. re-appears as work in the engine; all the rest is lost in various ways. The two chief causes of the inferiority of the steam-engine as a heat motor are the number of transformations or exchanges through which the heat has to pass before appearing as work, and the short range of the utilizable fall of temperature from 158° C. in the boiler to 40° C. in the condenser. It is different with the gas-engine, where the transformation is more simple, more direct, and consequently more economical. It is necessary, however, to bear in mind that thermal duty is not the only thing to be regarded. Economy of heat does not necessarily mean economy of money; and the calorie used by the steam-engine is less costly than the calorie required by the gas-engine. This is where the former has an obvious advantage, especially for high powers.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXXIII.

Not only have the mineral hydrocarbon fluids been turned to account in gas-works, but also some of the vegetable oils. At Jeypore (India), the staple material used at the gas-works is castor oil, supplemented with poppy, lil, or rape seed, when the castor seed is not available.* According to the returns of the Manager (Mr. S. J. Tellery), the yield per hundredweight of oil is about 1000 cubic feet of 26-candle gas, 1330 cubic feet of 18-candle gas, or 1600 cubic feet of 9-candle gas. With other oils the yield is from 20 to 30 per cent. less. The castor oil costs about 30s. per hundredweight; and the other oils are rather cheaper. Several details respecting the working of this undertaking are given, from which it appears that the retorts are set singly, and are made of wrought iron, 8 feet long and from 12 to 15 inches in diameter. The fluid is fed into them through a syphon; and the supply must be very carefully adjusted in order to secure the proper yield and quality of gas. Too rapid a supply is attended with rich gas and incomplete decomposition of the oil; and if the oil does not run in fast enough, the quality of the gas is spoilt. The gas is condensed and purified in the usual way, with the exception that a layer of cotton wool saturated with naphtha is used in the purifiers. The object of this is not stated, but possibly the naphtha is found to be useful as an absorbent of heavy hydrocarbons that otherwise might be condensed in the distributing-pipes. Some of the gas is compressed into wrought-iron receivers under a pressure of 45 lbs. per square inch, and in this form conveyed to customers at a distance. The castor plant grows in the immediate neighbourhood, and the oil is extracted at the works. Attempts have been made at other places to use the oil-bearing seeds in their crude state; but the produce was largely charged with carbonic acid, given off by the woody part of the seeds—necessitating a correspondingly heavy cost for purification.

Several practical details, and particulars of the special difficulties encountered by Mr. Tellery, are given in this as well as in a subsequent article.† There is some discrepancy with regard to illuminating power—the highest quality mentioned in the practical results above given being 26 candles; and yet repeated reference is made to the fact that the gas as supplied to the public gives a light equal to 17 or 18 candles when burnt at the rate of 1½ cubic feet per hour. From this it follows that the quality is nearer 60 than 26 candles; and the higher figure appears to be more like the quality we are warranted in expecting from the material. One hundredweight of the oil would comprise about 12½ gallons; so a make of 1000 cubic feet per hundredweight would be about 80 cubic feet per gallon. At first the year's working only showed about 1000 cubic feet per hundredweight; but subsequently Mr. Tellery was able to increase this to 1250 cubic feet, presumably without diminishing the quality. A large quantity of tar was obtained, and no profitable outlet seemed to be offered for it. So it was subjected to distillation in the usual way, and separated into naphtha, dead oil, and pitch. The naphtha was returned to the gas-retorts; but the oil and pitch were first diluted with raw oil to a sufficient extent to prevent excessive deposition of carbon or pitch in the retort or ascension-pipes, and then used for the production of gas. The dead oil was found to require about three times, and the pitch from four to five times its bulk of raw oil. There appears to be a certain amount of carbon deposited in the retorts; and it is sold under the name of "burnt coal." Some of the tar and pitch is also turned to account for the manufacture of lampblack and Indian ink on the works. The oil is evidently very costly, according to our notions of the value of gas-producing materials; being about 2s. 6d. per gallon. The working expenses per 1000 cubic feet are nearly 30s.; and the selling price is 36s. It is therefore not surprising to learn that Mr. Tellery was conducting experiments with a view of finding some cheaper material in the locality.

By far the greater amount of work in connection with the use of oils for gas-making purposes, has been done with refined products rather than with the crude vegetable or mineral substances. Amongst the various products obtained by the fractional distillation of crude fluid hydrocarbons, there are certain residues which realize only a low market value, such as the intermediate oil, in the Scotch paraffin trade. The special object is the obtaining of a particular quality of oil or spirit, suitable for use in lamps, or perhaps for special technical purposes; and the remainder, after abstracting this particular quality, is a bye-product. It frequently happens that such bye-products are really more suitable to the gas maker than the crude oils. The petroleum may be so saturated with gases and vapours as to be unfitted

* See Journal, Vol. XXXVII., p. 1118. † *Ibid.*, Vol. XLII., p. 312.

for transit in its virgin state. Often it contains sulphur or other impurities, or may be too heavy and rich in carbon, so that it cannot be advantageously gasified without frequent trouble from stopped ascension pipes, and the deposition of large quantities of carbon in the retort. When such heavy fluids are used, steam is employed, with the double object of gasifying the carbon and at the same time increasing the bulk of the gas obtained, by the decomposition of the steam in the presence of the excess of carbon, and the consequent formation of hydrogen and carbonic oxide. Unless the excess of carbon and the consequent consumption of steam are very moderate, the objectionable features of water gas as a diluent, already alluded to, will present themselves. Or perhaps the oils may contain large quantities of oxygen, in which case carbonic acid figures amongst the products. This is especially the case with regard to vegetable oils.

The usual experimental apparatus for testing coals, as supplied in gas-works laboratories, capable of dealing with the 1000th part of a ton at a time, may readily be adapted for experiments with liquid hydrocarbons; and the student who desires to obtain a good insight into the various practical details of this subject, is strongly recommended to undertake a sytematic course of experiments upon various fluid hydrocarbons, extending over a wide range of specific gravities. The only addition necessary is the means of supplying the fluid to the retort. This may consist of a wrought-iron tube carried through the lid to within a few inches of the back, continued a foot or so away from the point of the retort, so as to get out of the reach of the heat, and bent at the outer end to form a syphon or seal. It should be made to take apart, where it passes through the lid, for cleaning purposes. The hydrocarbon may be contained in a glass bottle having a tubulure fitted with a glass stopcock at one side near the bottom; and from this the oil can be supplied in regulated quantity directly into the open end of the iron tube. The bottle may be graduated on the side in hundredth parts of a gallon, or any other convenient standard; and the quantity of fluid used at each experiment may range from 1-20th to 1-10th of a gallon. A more accurate way is to see that the bottle is charged with an excess of the fluid, and to weigh it before and after the experiment. The loss of weight accurately shows the quantity of fluid used; and, the specific gravity being known, this can easily be converted into terms of gallons if desired. The contents of the U-tube should be accurately measured, and the exact quantity of the fluid under examination that is necessary to fill it should be poured in at the beginning of each experiment. It should not, of course, be filled from the bottle above described, since the syphon will remain full at the close of the experiment.

A convenient set of hydrocarbons for such a series of experiments is afforded by benzoline and paraffin oil (which may be obtained from any ironmonger or oilman), and by samples of naphtha, light oil, and heavy oil from the tar distillery. The respective specific gravities will be about as follows:—Benzoline, 0·7; paraffin oil, 0·8; naphtha, 0·9; light oil, 0·95; and heavy oil, 1·03. The weight per gallon is equal to the sp. gr. × 10; and from this simple rule we can easily calculate the number of gallons per ton, and so arrive at the cost of the yield from a ton of fluid for comparison with coal. Or this calculation may be worked out directly from the weight of oil employed in the experiment. The usual precautions must, of course, be taken to clear the apparatus from air or gases left from a previous working.

At present it is proposed to call attention to one or two points only in connection with the behaviour of these fluids under destructive distillation. None of them can be completely gasified; but after several trials it will be found that the benzoline and the paraffin can be so treated as to leave a small proportion only—perhaps less than 10 per cent. by weight—of the raw material, in the form of solid or liquid residuals. The heavier fluids, however carefully treated, leave considerable quantities of soot and pitch, besides tar, &c. So much is this the case, that considerable difficulty arises in working the heavy oil so as to secure a sufficient yield of gas at one operation to admit of measurement and examination. Speaking roughly, the heavier the fluid the greater the difficulty of gasifying it. Not only this, but the larger proportion of carbon and pitch produced leaves a smaller quantity and a poorer quality of gas.

The deposit of carbon in the retort is found to be a great objection, because it acts (either as a non-conductor of heat or in some other way not yet understood) very energetically in the direction of reducing the yield of gas. In practice, it must be removed at frequent intervals. The only way in which it could be retained in the gas would be by the admission of a limited supply of oxygen in some form, perhaps in the form of air or of steam, so as to carry off the carbon in the shape of carbonic oxide. The small proportion of carbon produced by the benzoline and the paraffin might be dealt with in this way. By the use of a carefully adjusted supply of steam, for example, the fluid could be completely gasified without charging the gas with too high a proportion of carbonic oxide. But as soon as the residue exceeds about 10 per cent. of the whole, a limit is reached at which complete gasification is not practicable. If the heavier fluids are used for gas making, the temperature must be so low as to admit of the formation of a sufficient quantity of tar to dissolve the pitchy matters, and carry them into the collecting boxes. Under these circumstances, the yield of gas may be very small.

The effect of the temperature of distillation in the case of oils is similar to that of coal. A low temperature means a comparatively small yield of rich gas, and a large proportion of liquid residual, which will be light and fluid in character. As the temperature rises, the gas increases in quantity and diminishes in quality, and the residual products approach towards a viscid and pitchy consistency. At the same time solid carbon or soot makes its appearance in gradually increasing quantity. At high temperatures the liquid products disappear altogether, and we have nothing but permanent gas and soot or lampblack. With the lighter hydrocarbons, this limit may be reached concurrently with the production of a good quality of gas; but with the heavier ones the luminosity of the gas will practically have disappeared. In most cases, it will be found that the point of production of greatest illuminating value falls considerably below that at which the liquid residuals disappear. In this respect we have another resemblance to the behaviour of coal under similar circumstances.

THE LONDON COUNTY COUNCIL AND THE WATER SUPPLY.—The London County Council have given notice of a "general powers" Bill in which they seek authority to "prosecute and conduct inquiries and negotiations relative to the supply of water, or Companies supplying water," in or near the County of London.

SOCIETY OF ARTS.—The opening meeting of this Society for the present session was held last Wednesday. Sir F. Bramwell presided; and, in the absence of the Duke of Abercorn, the Chairman of the Council, read the Inaugural Address which his Grace had prepared for delivery on the occasion. It was retrospective rather than suggestive; consisting entirely of a review of the Society's work in encouraging the arts, manufactures, and commerce since its foundation in 1754. At the close of the address, the medals awarded by the Society for papers read in the past session were distributed; among the recipients being Mr. W. J. Dibdin, F.I.C., F.C.S., for his paper on "Standards of Light," and Mr. A. B. W. Kennedy, F.R.S., for his interesting account of the objects and methods of the trials of motors conducted under the Society's auspices.

THE LABOUR QUESTION.—Following up his recent letter to *The Times* on the labour question, to which reference was made last week, Mr. John Aird, M.P., has formulated his proposals. His suggestion is to pass an Act creating trade courts for every industry and in every county. These courts to have an equal number of representatives from the employers, the employed, and the State. The expense of the organization is to be met by a contribution from every workman—say, of 1s. per quarter; a similar contribution being made by the employer for every workman he employs. All expenses are to be paid out of the fund, including an allowance to the working-class representatives while engaged in adjudicating at these courts; any balance available to be used, at the discretion of the court, to assist cases of serious accident where there is great distress and no legal claim upon the employer. The duties of these courts would be to settle and determine the rate of pay both for piece-work and for day labour, also the number of working hours for every industry; and, further, to adjudicate upon and settle questions arising under the Employers' Liability Act. Mr. Aird gives the following as the advantages of his plan:—Its adoption would practically get rid of the "sweating" system; wages would be determined by the existing condition of trade; employers would pay the same rate, and be able with greater security to take orders or enter into contracts; the proposed tribunal would settle, and without delay, matters in difference; ill-feeling would not have time to grow, as good advice would be available from those who understand the trade; strikes would be averted, and the homes of the working-classes saved from the distress that has always followed these movements.

PRESENTATIONS TO MR. F. DOUGHTY, OF MARGATE. — The *employés* at the works of the Isle of Thanet Gas Company at Margate recently entertained at dinner, at the Queen's Arms Hotel, the Manager (Mr. F. Doughty), in celebration of his fifty years' unbroken connection with the undertaking. Mr. J. Bayley, one of the Directors, presided; and a number of the officials were present. The toast of "The Guest of the Evening" was proposed by the Assistant-Manager (Mr. A. Middleton), and very warmly received. He then, in the name of the workmen, presented Mr. Doughty with an electro-plated tea and coffee set, suitably inscribed, to commemorate the completion of his half-century's service on the 11th inst. The Secretary (Mr. T. C. Fuller) also presented a walking-stick, as the joint offering of himself and Mr. Fulljames, the Collector. Mr. Doughty, in acknowledging the gifts, stated that he had made up his mind to retire in this, his jubilee year, and had mentioned his resolution to the Chairman of the Company (Dr. Curling). He, however, would not agree to any such suggestion; and subsequently told him (Mr. Doughty) that the Directors were unanimously of opinion that he should continue to discharge his duties a little longer. He had consented to remain at his post; but he could not have accepted the offer if he had not possessed such an able and qualified assistant as Mr. Middleton, who had followed strictly the lines laid down for his guidance. He concluded by proposing "The Health of the Directors;" coupling with the toast the name of the Chairman. Dr. Curling responded, and, on behalf of the Board, presented Mr. Doughty with a gold watch, as a token of their respect, and in recognition of his long and faithful service. Mr. Doughty said he scarcely knew how to thank them for so handsome a present, and could only say, in the fulness of his gratitude, that he hoped health, wealth, happiness, and long life might attend them all. Other toasts followed; the proceedings throughout being of the very heartiest character.

Technical Record.

PHOTOMETRY.

By JOHN METHVEN, Assoc. M. Inst. C.E.

[The concluding portion of a Paper read before the Southern District Association of Gas Engineers and Managers, Nov. 14.]

The first part of this paper was given in the JOURNAL last week, and it dealt with photometry as practised in the Metropolis under the "Instructions" of the Gas Referees; reviewing in the first place the work of the latter, and following with a record of observations and experiments which the author had made with the standard burner and chimney, and the effect of temperature upon the testings.

Experiments on the Value of the Light of Candle Flames.

In making the following experiments, the light value of the flame of the candle was found to depend on the position its wick held with regard to the disc. It must be observed that candle flames, like flames from fishtail burners, possess a flat side and an end, which, I think, drawing No. 3 will fairly represent. The

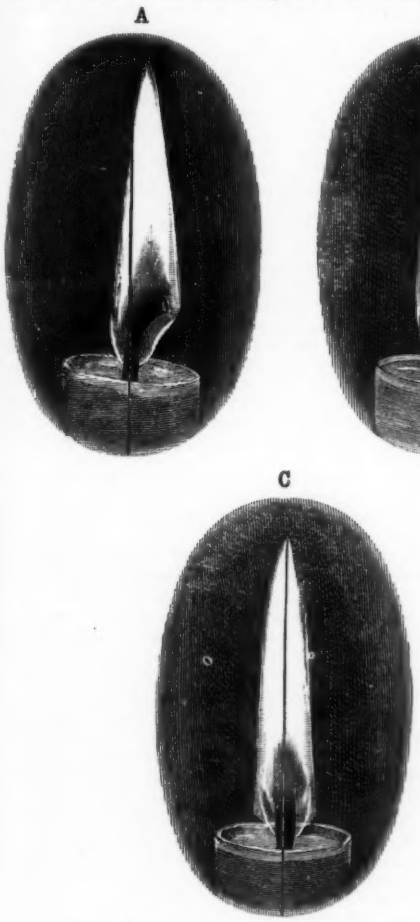

FIG. 3.

centres of the flames occupied one terminal of the photometer; and the candles were moveable, so as to place their wicks in the required direction. A Methven screen and disc-box occupied the other terminal, provided with a supply of gas of constant quality; but as the screen value was rather greater than two standard candles, the mean lighting value of the candles appearing low must be attributed to this cause. The following figures are the mean results of a number of candles. Two distinct candles were used on each occasion.

Position.	Light Value of Candle Flames in Standard Candles.
A. Plane of curvature of both wicks parallel to plane of disc	1·999
B. Plane of curvature of both wicks at right angles to plane of disc and bent away from disc	1·957
C. Plane of curvature of both wicks at right angles to plane of disc and bent towards the disc	1·933

Taking the mean light value of the two candles from these results as 1·972 candles, the position A gives a result 1·37 per cent. above the mean; position B, 0·76 per cent. below the mean; whilst position C gives 1·97 per cent. below the mean. It is evident therefore, that the position in which the wicks of the candles are placed (although the centres of their flames may, by means of an adjustable candle balance, occupy the terminal of the photometer) must cause a difference in the results of the testing. The Referees in their "Instructions" state that "the candles are to be so placed that the

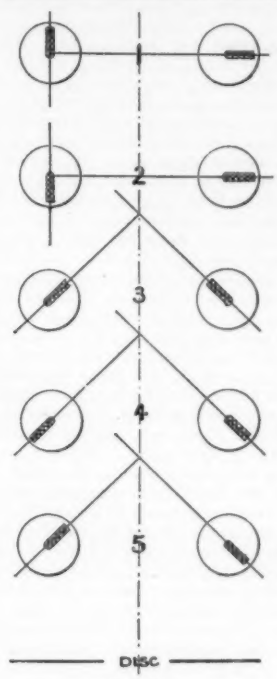

FIG. 4.

Diagram showing the various positions for placing the Wicks of Candles —all complying with the "Instructions" of the Gas Referees.

plane of the curvature of one wick shall be perpendicular to the plane of curvature of the other wick." There are several positions shown on diagram No. 4, in which the wicks of the candles may be placed so as to comply with these "Instructions;" but there is only one position in which they can be placed so that their mean lighting value should be exposed to the disc, and that position is marked 5 on the diagram.

This alteration of position of the candle wicks is of great importance in the Evans photometer, where the index on the scale represents the centre of the candle. Diagram No. 5 represents graphically the error likely to arise from this cause. In the

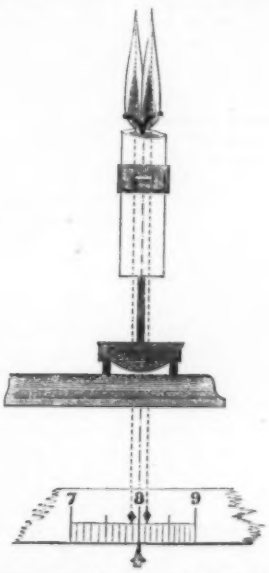

FIG. 5.—PHOTOMETERS WITH FIXED CANDLE HOLDERS.

Diagram showing the possible error due to the altered position of the candle wicks in the Evans Photometer. This error is increased on Photometers with shorter bars, and unprovided with adjustable candle balances.

same manner. The value of the candle flame was determined as above mentioned. The value of the light of the candle-flame was observed when the centre of the candle occupied the position of the terminal of the photometer, corresponding to the manner in which it is used in the Evans photometer. With the wicks turned from the disc, the light value for 240 grains of sperm consumed by the candles was found to be 1·953 candles; with the wicks turned towards the disc, the light value was 2·032 candles. This amounts to a difference of 4 per cent.; and the returned results of the testing will, of course, vary to that extent against the gas when the wicks are facing the disc, and in favour of the

gas when turned in the opposite direction. The difference on the diagram is represented as being 3·6 per cent.—a result fairly agreeing with the photometrical results. The "Instructions" of the Referees provide for nearly one-half of this possible error; but to make them complete the position shown in fig. 4 (No. 5) should be adhered to. If candles were used in photometers in this position, the variations in photometrical results which have hitherto been ascribed to candles would to a great extent be removed. I have systematically used candles in this position; and the maximum and minimum variation from the mean of daily results, extending over twelve months, have been plotted on diagram No. 6*. Each day three separate pairs of candles were used in conformity with the statutory requirements—first in the open photometer, and afterwards in the closed photometer. To obtain a correct comparison, both photometers were connected to the same meter; and the same burner was used in each instrument. It will be observed that the mean variation on the open photometer for the year was above the mean for the day, 1·59 per cent.; below the mean for the day, 1·37 per cent.—together giving an outside variation of 2·96 per cent. The same candles used on the Evans photometer gave a result rather better—1·44 per cent. above the mean of the day; and 1·36 per cent. below the mean of the day, or an outside variation of 2·80 per cent. A Methven screen was used daily on the open photometer, and was found to possess a higher value, by 2·87 per cent., than the mean candle results on the open, and 5·78 per cent. on the closed or Evans photometer. This record of candle work is very interesting, as it may be compared with the results obtained by Mr. Dibdin, and published in his report to the late Metropolitan Board of Works in 1887. The results of the two investigations differ materially. They show how necessary it is, before a decision is arrived at to condemn the use of candles, that they should have fair play; that only parliamentary tests should be made and recorded; and that on all occasions the mean lighting value of the candles should be exposed to the disc. That the photometer room should be kept at an uniform temperature is not the least important condition.

My experiments in determining the amount of light developed by candles burnt in an atmosphere of varying temperatures, show that, when the temperature of the air supply is at 50°, the developed light for 120 grains of sperm consumed was 1·198 candles; and by increasing the temperature of the air supply to 72° Fahr., the power of the light developed was reduced to 1·041 candles, or a decrease of 13 per cent. The mean quantity of sperm consumed during the experiments was 120·2 grains per hour at the low temperature, and 119·7 grains at the high temperature—an inappreciable difference.

Professor Tyndall, in his work on "Heat a Mode of Motion," refers to experiments made by himself and Dr. Frankland, where they observed the different appearance of the flames of candles burning at the base and afterwards at the summit of Mont Blanc. He says: "The aspect of the six flames surprised us both. They seemed the mere ghosts of flames produced at Chamouni, enlarged, pale, feeble, and suggesting a greatly diminished energy of combustion. The candles being carefully weighed on our return, the unexpected fact was revealed that the quantity of stearine consumed above was precisely the same as that consumed below. Thus, though the light-giving power of the flames was diminished in an extraordinary degree, the rapidity of combustion was unchanged. This curious result is to be ascribed mainly to the mobility of the air at this great height. The particles of oxygen could penetrate the flame with comparative freedom; thus destroying the light and making atonement for the smallness of their number by the rapidity of their action. I find, indeed, that by reducing the density of atmospheric air to one-half, we nearly double the mobility of its atoms." My experiments on candles follow the same direction as those quoted above; but I am disposed to attribute the loss of light I experienced at the high altitude to another cause—viz., the presence of aqueous vapour in the air, which at the high altitude was present in greater volume than at the low.

I have made some experiments on the effect of aqueous vapour in the air and its influence on the light developed by candle flames. I find that candles, burning in the ordinary atmosphere, where the temperature from day to day was practically constant throughout the experiments, possessed a light value of 1·104 candles, compared with a light of constant power, per 120 grains consumed, which was increased when they were burnt in a dry atmosphere to 1·196 candles per 120 grains, or an increase of 8·38 per cent. This great difference in the light value was due only to the removal of the aqueous vapour with which the air of the room was laden; and, I think, due to that cause alone, for the mobility of the air was unaltered as the temperature remained the same.

Experiments on the Influence of Aqueous Vapour on Flames from Different Burners.

Diagram 7 (in which the ordinates represent the temperature of the air supply to the burners, and the abscissæ the illuminating power in candles) shows the effect produced by supplying flames with dry and saturated air at a constant rate. The lines marked

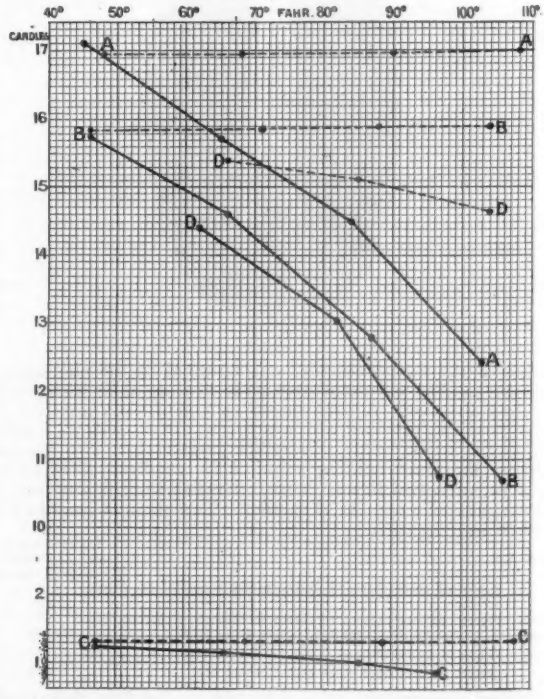

FIG. 7.

A, show the development of illuminating power from a flame consuming 5 cubic feet per hour in a Sugg's "London" Argand, when supplied alternately with dried and saturated air. The dotted line represents the dry air supply, and the black one the saturated air supply. It will be observed, when dried air is supplied to the flame, the light therefrom is practically of constant quality; but

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* Fig. 6 consists of four elaborate diagrams, showing the value of the comparison flame burning 5 cubic feet of gas per hour, with candles on the open and closed photometers respectively and the Methven screen. The experiments extended over twelve months. One apparatus only was used for the two photometers; the open photometer used being of the Lambeth testing-station pattern.

SERIES 1.—*The Methven Screen (used in the Open Photometer) compared with the average of Daily Tests by Candles in the Closed Photometer, gave the following results, all below the Mean:—*

	Greatest.	Least.	Aver.		Greatest.	Least.	Aver
Jan.	6·00	4·20	5·90	July	9·80	4·80	6·47
Feb.	9·30	2·70	5·60	Aug.	7·30	3·75	5·40
March.	9·00	1·00	5·77	Sept.	7·15	4·25	5·60
April	9·00	3·50	6·35	Oct.	6·50	4·30	5·40
May	8·80	3·60	6·17	Nov.	6·75	4·50	5·60
June	6·90	3·50	5·65	Dec.	6·60	4·40	5·50

SERIES 2.—*The Methven Screen compared with the Average Daily Tests by Candles on the Open Photometer gave the following results, all below the mean:—*

	Greatest.	Least.	Aver.		Greatest.	Least.	Aver.
Jan.	4·50	2·15	3·18	July	4·85	1·60	3·27
Feb.	4·50	0·75	2·90	Aug.	4·70	1·50	2·68
March.	7·00	1·10	3·21	Sept.	4·10	1·80	2·70
April	6·50	1·35	3·21	Oct.	3·50	1·85	2·40
May	5·60	1·00	3·02	Nov.	3·30	1·45	2·50
June	3·65	0·80	2·55	Dec.	4·50	2·15	2·86

SERIES 3.—*In the Candle Experiments on the Closed Photometer, the Percentage Maximum Variations from the Average of each Series of Tests were as follows:—*

	Above the Mean.			Below the Mean.		
	Greatest.	Least.	Aver.	Greatest.	Least.	Aver.
Jan.	3·35	0·40	1·20	2·70	0·40	1·10
Feb.	6·25	0·35	1·20	4·85	0·50	0·95
March	6·25	0·10	2·36	6·85	0·10	2·44
April	3·80	0·30	1·48	3·75	0·30	1·67
May	5·00	0·05	2·07	4·80	0·05	2·07
June	4·55	0·50	2·61	3·60	0·50	1·85
July	2·35	0·20	1·20	2·70	0·20	1·21
Aug.	2·60	0·15	1·25	2·50	0·15	1·30
Sept.	2·80	0·15	1·08	3·15	0·05	1·12
Oct.	2·40	0·20	0·99	2·00	0·35	0·94
Nov.	2·30	0·50	1·06	2·35	0·50	1·00
Dec.	2·00	0·15	0·85	1·50	0·15	0·70

SERIES 4.—*In the Candle Experiments on the Open Photometer the Percentage Variations from the Average of each Series of Tests were as follows:—*

	Above the Mean.			Below the Mean.		
	Greatest.	Least.	Aver.	Greatest.	Least.	Aver.
Jan.	2·30	0·10	0·70	2·15	0·10	0·78
Feb.	2·50	0·15	0·90	2·50	0·10	0·60
March	4·50	0·15	2·12	5·00	0·10	1·50
April	6·55	0·50	2·68	5·40	0·50	2·20
May	4·50	0·70	2·24	4·75	0·40	1·85
June	4·55	0·70	2·04	3·00	0·85	1·75
July	4·85	0·50	1·99	3·65	0·50	1·63
Aug.	3·50	0·10	1·60	2·10	0·15	1·46
Sept.	3·20	0·35	1·40	2·35	0·45	1·30
Oct.	2·15	0·40	1·10	4·65	0·15	1·10
Nov.	3·20	0·25	1·23	2·65	1·50	1·20
Dec.	2·50	0·15	1·07	2·20	0·15	1·15

when a saturated air is supplied, with increasing temperature, the light value is rapidly diminished. Thus we have, between the temperatures of 50° and 75°, a loss of 10 per cent. of light value from the 5-feet flame. The lines marked B represent the results produced from the same cause on a flat-flame burner consuming a fixed rate of 5 cubic feet per hour within a globe. With dried air supplied to the globe, a constant value of light results at all temperatures; but with a saturated supply, the light value diminishes as in the former case. Between the temperatures of 50° and 75°, 11·2 per cent. loss of light occurs. Lines marked C represent the effect produced on a flame of ordinary gas 2¼ inches in length, consumed with a chimney, from a Harcourt's pentane standard burner. With dry air supplied to the flame, the light was absolutely constant; but when a saturated air was supplied, loss of light, increasing with the temperature, was the result. Between the temperatures of 50° and 75°, the reduction of light value was 13 per cent. Within the ranges of temperature which I have selected as being possible—changes which may occur in any testing place—there is a marked increase in the loss of light between the experiments A, B, and C. This I believe to be due to the powers of the different lights to battle with the aqueous vapour with which the air was charged.

In carrying out the above experiments, I arranged an apparatus which made provision for dispensing with the forced, or controlled, supply of air, and permitted the burner to induct its natural air supply. Lines D on diagram No. 7 represent the development of light from a 5-feet flame in an Argand burner supplied with its natural supply of air. The amount of air inducted by the burner under these conditions was ascertained, after each experiment, by closing the large port and attaching the tube conveying the controlled supply of air. The rate of air was then adjusted so as to attain the same development of light from the flame, which was at all times burning at a rate of 5 cubic feet per hour. It was found that, as the temperature increased with dried air, the burner inducted a larger volume of air. Thus at the temperature of 66°, the illuminating power of the flame was 15·4 candles, and the volume of air was found to be at the rate of 34·26 cubic feet per hour. At 85°, the light was reduced to 15·1 candles; while the air supply was found to be equal to 37·62 cubic feet per hour. Increasing the temperature to 104°, the light was reduced to 14·7 candles; while the air supply was found to be 39 cubic feet per hour. When the air supply was saturated, very nearly the same increased volume was inducted by the burner, with a similar reduction of development of light, as with the other saturated air experiments. It was evident, however, in the last experiment, that if a constant light was desired, a constant volume of air must be supplied to the flame within the chimney.

Subsequent experiments, indicated on diagram No. 8, showed that, with either dry or saturated air, the light from a flame consuming 5 cubic feet per hour developed less light as the rate of air increased. In the case of dry air, with an increase of 48·8 per cent. of air, I obtained a decrease of light of 20 per cent.; or, in other words, a decrease of illuminating power equal to 0·076 candle for every 1 per cent. addition to the air supply. In the case of the saturated air supply, although the experiments are not comparable, as they were not made with the same gas, yet I find a very similar reduction of light with an increased air supply—50·6 per cent. of increase in the air supply resulted in a decrease of illuminating power of 21·3 per cent., or an increase of 0·071 candle per 1 per cent. of increase of air supply. These experiments are useful in showing quantitatively the effect produced by increasing or decreasing the supply of air to Argand burners. In substituting chimneys of various sizes, the amount of air inducted by each might be arrived at by determining the light value of the flames.

It must be remarked that the experiments on diagrams Nos. 7 and 8 represent exaggerations of results which are likely to occur in the natural condition of our atmosphere and to standard burners

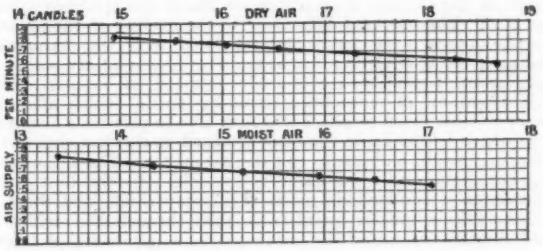


FIG. 8.

consuming gas under normal conditions. The experiments with a supply of moist and dry air were made in rapid succession, and the density of the atmosphere of the room in which they were conducted remained constant, as did also that of the gas; but they are useful in showing what an enormous effect is produced on the combustion of flames by the presence of aqueous vapour in the atmosphere in which they are consumed. Also, in the case of the increased air supply, taken in connection with the remarks I have made on standard burners, prove that the light developed by these burners is entirely under the influence of the condition of the atmosphere for the time being. Alterations in the density of the atmosphere must either increase or decrease the power of the chimney for inducting its volume of air; which volume must in its turn influence the development of light from the flame as it is varied. For the same reason, any form of construction of photometer which tends to cause the atmosphere in the vicinity of the burner to take an upward direction, must present additional facilities for the burner to induct more air than it otherwise would, and consequently affect the development of light from the flame. Also, any form of photometer which tends to decrease the temperature of the air surrounding either the gas or the candles, must in its turn cause the burner to induct more air, and the candles to develop more light, as my experiments show they are wont to do. Under these circumstances, I think I am justified in stating that, without an atmosphere of constant barometrical pressure and temperature, the development of light from the flame within an Argand burner will always vary. As the Argand burner is the measure by which the gas is measured and sold to the public, it is evident that elasticity is one of its properties; and although it may be lodged with the Warden of the Standards as a standard, it is a fact that we scarcely have two days in succession when it can possibly give the same development of light from the same gas.

I expect my remarks on this subject will not be endorsed by our scientific friends, who, I doubt not, possess the idea that the presence of aqueous vapour and its effect on flame combustion, is the same with every flame, and therefore it cannot possibly influence photometry. The decision I arrived at is based on the results of my experiments. I have shown that within a range of 22° Fahr., candles vary in the light they develop to the extent of 13 per cent.; a flame from a Harcourt burner within the same range varies very nearly 10 per cent.; whilst the flame from an Argand burner varies only 8¾ per cent. It is well known also that with all open flames the greater development of light per foot of gas burnt is obtained from an increased consumption. A combination of small flames will develop more light per cubic foot collectively than each flame will do singly. This result undoubtedly is due to the same effect which produced the difference in the percentage of loss of light in the Argand burner compared with the candles—viz., to the size and consequent power of the flame to withstand the cooling effect of the action of the aqueous vapour in the air. It is evident from what has been said that any flame, or part of a flame, which may have been used or intended for a standard of light must from day to day be affected by variations of temperature or barometrical pressure of the atmosphere. It is further evident that any flame thus used has been mis-named, for a standard of light, to be a standard at all, must possess an unvarying power.

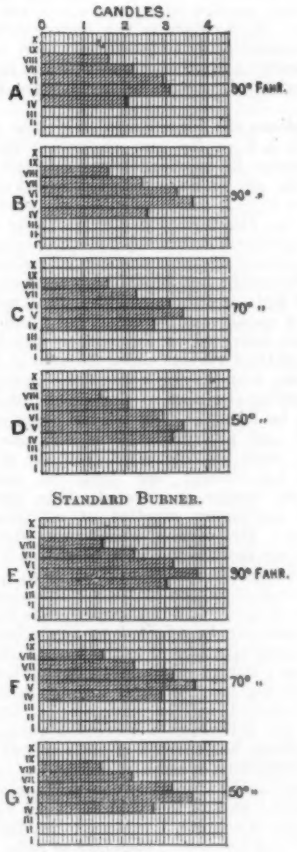


FIG. 9.

Light Value of the Horizontal Portions (¼ inch deep) of Flames, with varying conditions of Air Supply.

In considering the question of the varying development of light from flames, I was induced to analyze the flame of an Argand, especially the portions of the flame used in the Methven screen for

photometrical purposes Diagram No. 9 represents the light value of the horizontal portions of the 2½-inch flame, burning under natural conditions, and also under conditions in which the supply of air to the carburetted flame is controlled and freed from its accompanying volume of aqueous vapour. The diagram is drawn to scale; the horizontal divisions representing the flame divided into spaces ¼ inch deep. The vertical lines represent candles and tenths of candles. Scales marked D, C, B represent respectively the value of the horizontal portions 4, 5, 6, 7, and 8 when supplied with a natural air supply at temperatures of 50°, 70°, and 90°. The variations, coloured black, show graphically the effect of temperature on that portion of the flame used for a photometer standard. Scale A represents at the temperature of 90° the effect produced by a saturated atmosphere on the same portions of the flame. An inspection of the diagram will reveal an important alteration in this case. The scales below, marked G, F, E, indicate the value of the same portions of the flame when supplied with a dried atmosphere of varying temperatures, but of constant volume. It will here be observed that the values of the portions of the flames coloured black are practically equal, so that it is quite possible to take a portion of a flame so supplied with dried air which shall, under all conditions of atmosphere, give a standard amount of light with unvarying regularity. We saw by diagram No. 7 that the whole flame of an Argand burner gave a constant amount of light when supplied with dried air; we now have proof that the detailed parts of the flame possess separately an uniform power under a wide range of temperature. A standard of light of such construction, and one worthy of the title, I have the honour to submit for your inspection, attached to a new description of photometer.

I have endeavoured to show in this paper—which I fear is getting rather a long one, and consequently incurring the risk of straining your patience—first, that the action of the Gas Referees in altering the photometers in the manner they are now doing is calculated to engender the feeling that impartiality is conspicuous by its absence. Second, that in prescribing the standard burner, they have disregarded the small chimney with which it is associated, and prescribed the use of one which oftentimes fails to develop the full value of the gas. Third, by the interpretation of various clauses in the Acts of Parliament to which I have referred, I hold they are not justified in making these changes. I have shown to what an extent changes in our variable atmosphere alter the light-developing qualities of the standard burner, and also of the standard candle. I have further shown that, despite the care exercised in using these candles, there is an influence operating on the development of their light which we cannot well control. The actions of the Referees, I fear we must put up with—at any rate until they see in another light the effect of the alterations they are now making. With regard to the burner and the candles, I am prepared to make some suggestions which to my mind tend to make photometry a more scientific art, and impart to it accuracy—a quality which, I venture to say, it does not now possess, or ever did.

My suggestions are incorporated with the new form of photometer which is here for your inspection to-day; and to which I have already in some measure referred. The burner for consuming the gas to be tested is provided with an arrangement for supplying it with a controlled supply of dried air. For convenience to-day, I have fixed to the air-holder to which the burner of the photometer is connected a power meter, which I hope will succeed in preventing the necessity of refilling the holder each time it is exhausted; but for ordinary work the power meter may be dispensed with, and the air-holder alone used. The air-holder possesses the usual scale of cubic feet; and by this means the volume of air delivered to the burner may be regulated. By a series of weights of various sizes, the rate of air can be regulated with precision, even in the case of the antiquated holder before you. By opening the port in the air chamber under the burner, the gas may be lighted. The holder being weighted to suit the temperature and pressure of the air, the burner may now be supplied with its corrected volume of air for the time being; and by closing the port, all communication with any other air intake is severed. The gas to be tested is under these conditions supplied at all times with the same volume of air. The carbon constituents (from the very fact of the flame being maintained at a height of 3 inches, irrespective of the rate per hour necessary to produce it) will at all times have the same volume of oxygen for their combustion, and of course the development of light will be in proportion to the quality of the gas, and cannot possibly be affected by any other factor. I propose to adopt the same attachment to the burner which yields the light of comparison; but in addition to drying the air supply to the burner, I pass the gas used first through a desiccator, then over pentane. Provision will be made, as at the other end of the photometer, for delivering a corrected volume of air, which of course will always be deprived of its aqueous vapour. This will result in the standard of light (which will as usual, be a portion of the flame only) being absolutely consumed without the presence of aqueous vapour; and as the volume of air supplied will be at all times corrected in volume, I venture to predict that the result will be a constant and unvarying standard of light. The combination of the disc and standard represented in this photometer is useful in maintaining a constant emission of light through the slot; and the tunnel through which this light passes into the disc delivers the whole of it where it is required, and effectually prevents the access of other light which is not required. The facility for moving the light to be tested, and the advantage of the long scale, have been before alluded to. The description of the instrument is thus completed. For general use, I fear the introduction of such an instrument may be attended with some difficulty connected with the fulfilment of statutory requirements; but for scientific purposes, and when accuracy of results is required, I have the greatest confidence in its behaviour, as its results when once rated will, at all seasons of the year, and with their attendant changes in the condition of the atmosphere, produce the true value of the gas to be tested.

I have also the pleasure of showing you in operation an improved jet photometer, which I have altered in such a way that the main objections attached to the old form of instrument are removed. A jet photometer is essentially a very delicate instrument. It is exceedingly sensitive to changes of temperature. In the improved

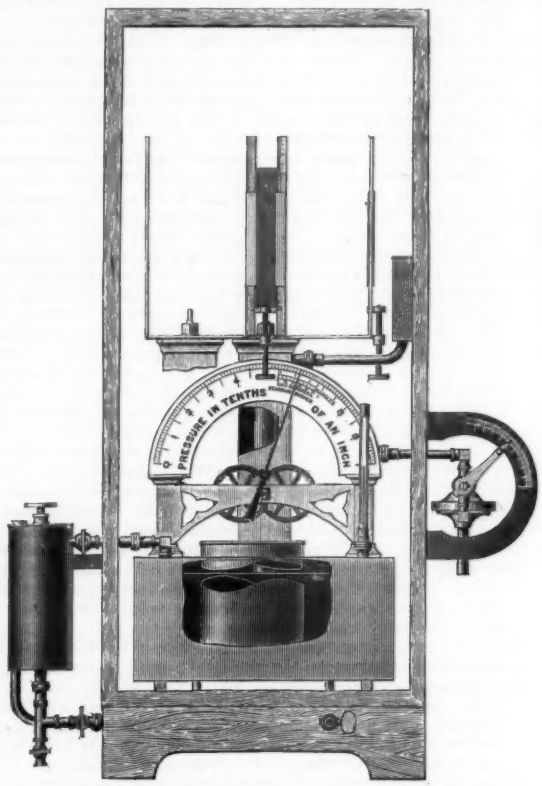


Fig. 10.—Methven's Improved Jet Photometer.

instrument, I have water jacketed the whole of the gas-ways, to which I attach a small circulating pipe, so that I can maintain the gas at a constant temperature. The temperature I adopt is 80° Fahr., having found it a convenient one to use, as it leaves a sufficient margin in the hot weather for adjustment. This alteration, you will observe, removes one of the chief objections. The next one I have overcome is the effect on the instrument of barometrical pressure. I have succeeded in doing this by adjusting the height of the flame so as to suit the barometer for the time being. The scale I adopt is the result of observations extending over twelve months. Daily a comparison was made, after the temperature of the instrument was adjusted, with the indicated results of the Letheby photometer on which the Methven screen was used. The observed differences in the reading of the jet and the photometer were noted and tabulated with the barometer readings; the result being that at the termination of my period of observation, I had a considerable number of results under each alteration of barometer, tenth by tenth, which afforded, a very reliable mean result. I was thus able to prepare a diagram, from which I have made the scale attached to the instrument for correcting height of flame to suit the barometer. The action of a high barometer on the jet flame is two-fold. In the first place, the volume of combustible material is compressed, and there is consequently a greater quantity to pass through the orifice of fixed dimensions under the same pressure, producing a longer flame; and, in the second place, the higher density of the atmosphere in which the jet is consumed tends to decrease the length of the flame. So the high barometer acts upon the flame in both directions. It was this factor which necessitated the observations under a range of pressures which I have made. I have referred only to the high barometer. Of course, the reverse effect is produced with a low barometer. These combined alterations are improvements which will speak for themselves; and it will be enough for me to state that they impart to the instrument a degree of reliability which enhances its value to the gas maker considerably. The instruments can be rated so as to agree with any photometer, or adjusted to indicate within a moderate range the value of the gas with which they are supplied.

In drawing my paper to a conclusion, I must apologize for its

length. The circumstances under which it has been prepared have to a great extent denuded it of the charm which generally fascinates writers on pet subjects; and its completion has been to the writer a great difficulty. But, if it results in a good discussion, his labour will be rewarded, and the time of the meeting will not be absolutely wasted.

AMERICAN GASLIGHT ASSOCIATION.

[Abridged from the "Official Report" in the *American Gaslight Journal*.]

(*Continued from p.* 968.)

At the close of the President's Inaugural Address,

Mr. E. B. Ellice-Clark, at the invitation of the President, addressed the meeting on the subject of the Brin oxygen process of purifying gas. He described the method of obtaining pure oxygen from the atmosphere, through the medium of barium oxide; claiming that in many districts oxygen of 90 per cent. purity could be made on the gas-works as cheaply as coal gas. Attention was next directed to the experiments that have been tried by Mr. S. R. Ogden, at Blackburn, and Mr. W. A. Valon, at Ramsgate. He stated that Mr. Valon would be able, with the aid of the oxygen process, to abandon the use of cannel, and to increase his make of gas per ton of coal from 10,000 to 11,000 or 11,500 cubic feet—still maintaining purity and quality. The smallest scale on which oxygen could be economically obtained would be a plant making 1000 cubic feet per 24 hours.

Mr. E. C. Jones (Boston, Mass.) read a paper on "Leakage and Condensation." He commenced by quoting from "King's Treatise on Coal Gas," and the Massachusetts Gas Commissioners' report, with a view of showing that, while every care had been bestowed upon the manufacture and purification of gas, the distributing plant had been neglected. According to the former authority, while the percentage of unaccounted-for gas has been greatly reduced within the last 20 years, the actual quantity so lost has increased. In the Massachusetts report for 1887, the average percentage of unaccounted-for gas was 12·53; but in that for the following year it was 13·17—showing that in the States the leakage was increasing rather than diminishing. The proportion last named represented no less than 276 million cubic feet of gas, or more than 25,000 tons of coal. One cause of the high leakage in Massachusetts was the use of small mains. He had calculated the internal area of the mains of each of the companies, and found the average to be 113,629 square feet; the average per mile of pipe being 5297 square feet. The average diameter of all the mains was less than 4 inches. He also found that the greater the main area per mile the less the leakage. Dividing the companies into five classes according to main area, the leakage ranged from 10 to 15 per cent. In further proof of this, he might mention the well-known fact that leakages were usually confined to small mains; being much more frequent in 3-inch than in those of 6-inch diameter or upwards. Extreme climate was partly concerned in this, as the small amount of metal in the pipes 3 inches in diameter or less would not withstand the forces of freezing and thawing. The larger pipes were subjected to the same strains, but possessed greater strength to resist them. If the unequal contraction and expansion of soils of different degrees of conductivity could be represented in pounds pressure, and the pipe considered as a bearer for carrying the load, he thought all mains less than 6 inches in diameter should be made of wrought iron; and he had therefore entirely given up the use of cast-iron mains so small as 3 inches in diameter. The statistics above alluded to showed that the effects of exosmose, or the leakage of gas through the pores of the iron, had been over-estimated. One company had 6022 square feet of main area per mile, and a leakage of 11½ cubic feet of gas per square foot per annum; while another had 3864 square feet of area, and a leakage of 60·6 cubic feet per square foot. Large mains, properly cared for, were a preventive of large leakage. In South Boston all mains are laid with cement joints, made by using two hard twisted rolls of lath-yarn, and a mixture of two parts of common cement, one part of Portland cement, and one part of sand. The joints are carefully pointed after making, and when they are properly put together, the author stated that they are rigid, and fully as strong as any part of the pipe. At each street intersection a long end-valve is put in; and on one side of the valve is a lead joint, to allow of expansion and contraction in one-half of the block. The lead joints are exposed to view on raising the cover of the valve-box, and any leakage could be quickly discovered. Mr. Jones said he did not use lead joints generally, because he believed that all such joints leak; and he preferred one broken main to a thousand small leaks which were not large enough to make their existence known, except as unaccounted-for gas. Instead of using bends for connecting service-pipes, he employed two elbows, the one which is screwed into the main facing the same direction as that in which the main is laid, and the other at right angles. This arrangement constituted nearly a universal joint, allowing for strains due to pitch of service, movements of service or main, &c. Three-quarter inch services were laid on each side of the street valves, so as to admit of testing, for leakages in the usual manner. A 10-light meter packed in a tin case surrounded with sawdust, with a dial on the top, was used for this purpose. In districts where there was a large day consumption, it was necessary to resort to Sunday testing, and sometimes cards were sent to consumers on a section of the main, giving notice that the gas would be shut off for ten minutes for testing purposes. A twisted steel sounding-bar, fitted with a loose cross-bar handle, was used for the location of leakages; being driven into the ground at short intervals by means of a sledge. The special shape permitted of easy removal; or, if preferred, a hexagonal steel bar, fitted with a wrench handle, might be employed. Formerly the sense of smell was depended upon for the detection of gas in the bore-holes; but lately he had used, with considerable success, test-papers steeped in a solution made by dissolving 3·75 grammes of palladium chloride and 1·25 grammes of gold chloride in a litre of distilled water. To use this paper, he had a glass bulb fitted with a removable cap and hook for the slip of paper, attached to a piece of ¼-inch pipe long enough to reach to the bottom of the bore-hole. A short tube passing through the cap was connected to an aspirator. By this means he was able to aspirate air from the bottom of the bore-hole through the bulb and in contact with the test-paper. If gas was present, the paper first turned a light rose tint, followed by a series of drab and brown shades, till it became a dark seal brown; and this variety of tints enabled the operator to form some opinion as to the extent or proximity of the leak. In conclusion, the author pointed out that differences in temperature at the station and at the consumers' meters had something to do with unaccounted-for gas. The temperature at the station meter could be readily recorded; and as to the selling temperature, he found that the mean air temperature might be taken. The difference between the two would form a constant by which the volume of gas made might be corrected. The measuring temperature might be as much as 20° above the selling temperature, which would mean a difference of about 4 per cent.

Discussion having been invited by the President, Mr. Gilbert said that after 30 years' experience he had come to the conclusion that loss of gas was mainly attributable to not laying pipes deep enough in cold latitudes, and to careless and imperfect work in making joints. The pipes should be so far down that the frost could not reach them. Another cause of leakage was the corrosion of the wrought-iron services. He had lately made it a point to encase every service in a wooden box with asphalte; and he strongly recommended the plan. Mr. Sherman thought that a heavy loss was due to the consumers' meters. He knew an instance where the leakage was reduced from 20 down to 10 per cent., merely by overhauling and repairing the meters. In his opinion, many consumers were furnished with night lamps without charge, as the meters allowed a small quantity of gas to leak through; and there was also the gas which was surreptitiously used. All these things counted as leakage. Mr. Starr agreed; believing that the actual leakage in the ground was but a small fraction of the whole—the main factors being defective meters, underrated street-lamp burners, &c. Mr. Littlehales said that dry meters were very apt to gradually run slow, till at last they ceased entirely to register. He had recently tested a 50-light meter, and found it to measure correctly at the maximum quantity; but with only 10 lights it was 25 per cent. slow, and with 5 lights it did not register at all. His Company was subject to a regulation whereby every meter must be tested once in five years by the Government Inspector. He thought his small leakage account was mainly due to this regulation. Mr. M'Elroy said the lead joints had proved utterly useless for natural gas at Pittsburgh. There was not one in ten that did not leak. Cement joints were used, and found to be perfectly sound. He laid his pipes from 3 to 4 feet below the ground; and the depth of the joints was from 4 to 5 inches. Mr. Young said that cement joints were the tightest yet made, but they were so rigid that there was no "give" in them; and unless a lead joint was put in about every 100 yards, there would be many breakages, especially with small pipes. He agreed that the temperature at the station meter should be carefully registered. Mr. Lansden said the real question was to get the pipes deep enough to avoid the influence of temperature. A flexible lead joint would draw; and with a rigid cement joint, the main would break. For his part he preferred a drawn joint to a broken pipe.

Mr. Jones, in replying, said he had never found the double elbows stopped with naphthalene. He believed that an average test of all the meters in a district would show a loss to the company. He had never known a properly made cement joint to draw or leak. He laid the street valves 500 feet apart, with a lead joint on one side. In one case the lead joint was omitted; and a breakage on the line of pipe was the result. But with the lead joint, there was no trouble. The mixture mentioned in his paper acted satisfactorily, and was stronger than the cast iron itself. Some of the best results he had were obtained with shallow mains, exposed to the frost all the winter. The point of constant underground temperature was 50 feet below the surface; and anywhere in that 50 feet a lead joint would be affected. It was better to have the pipes exposed to frost all the winter, than situated at a depth where they would be exposed to fluctuations—frozen one night and thawed the next. He preferred soft yarn to old rope for making the joint, and a twist of this was driven in round the pipe with a caulking-iron and hammer. The cement was first mixed dry, then tempered with water to the consistency of mastic, and well driven into the joint with a wooden caulking-tool. A second twist of yarn was driven in, and the cement filled into the edge of the socket.

A paper on "Fuel Gas," by Mr. Walton Clark, of Philadelphia, was next read. It has already been given in full in the JOURNAL for the 12th inst. (p. 921).

Mr. Burdett Loomis (Hartford, Conn.) opened the discussion on this paper. While agreeing that a mixture of water gas and coal gas without any producer gas was an ideal gas that they should all aim to make, he pointed out that for certain purposes, such as in

metallurgy, the flame temperature would be too high, and a mixture of producer gas was desirable, or even pure producer gas alone. He was not specially in favour of mixing producer gas with water gas for distribution; but his idea was to build a generator that would make any kind of gas that was practically needed. Perhaps the heating power of the gas recommended by Mr. Clark might be so high that it would not burn in an open burner, but would require a Bunsen burner. He thought that fuel gas for domestic purposes should be consumed by means of an open burner, as it was not possible to burn gases thoroughly in a Bunsen burner without varying the pressure or air supply. By mixing a large quantity of water gas with coal gas, it was possible to obtain a high flame temperature that could be used with an open burner. He agreed with Mr. Clark in the matter of pressure; having found that, for metallurgical purposes, better results were obtained with 10 inches than with a higher or a lower pressure. As to the use of producer gas from the water-gas cupola for heating the coal-gas retorts, he thought Mr. Clark had failed to recognize the fact that producer gas generated in "blowing up" was partly burned in the making. While blasting, air was carried in; and the gas was partly consumed while passing up the side of the furnace. Thus on reaching the top it was not equal to the production of 80, 60, or sometimes even 50 units of heat; whereas the pure producer gas should have from 120 to 130 units of heat per cubic foot. The sensible heat carried by the gas was not of much use in the furnace. It was better to employ it for heating steam for running the apparatus, or it might be used to good effect for heating the air supply to the furnace. He had proved by practical experiments that heating the gas from 300° to 500° did not effect any economy, but if the air supply was heated to the same extent, there was a considerable saving. Mr. Head, the assistant to Mr. F. Siemens, had observed the same thing; and it was important as showing that producer gas could be cooled and carried either one mile or a hundred miles, and then be used with as good effect as when hot from the furnace.

Mr. Denniston (Pittsburgh) thought there was no question as to the possibility, or even the practicability, of making fuel gas. In some recent experiments, he found that a high-power heating gas could be produced from steam, oil, and air, generated on a plan entirely different from that suggested by Mr. Clark; also that coal dust could be advantageously used where it was cheap. It might even be desirable to obtain it by crushing nut coal and slack, as it would have to be ground fine enough to admit of spraying into the retorts or generators. This plan would be especially applicable if it was decided to make a gas for illuminating only. Fuel gas could be made from culm or coal dust, slack, and oil, oil and steam, or from a combination of these materials; and hot air could be used with advantage in the manufacture. It had been asserted that hot air cost, in energy to heat it, all that it was worth in the furnace; but when it was heated by waste heat that would otherwise be lost, it was the means of utilizing a waste product. His experiments so far had been for the purpose of getting a fuel gas that could be used in iron, steel, and similar furnaces, and not for general distribution; but if they were successful in this, the other would be sure to follow.

Mr. A. C. Humphreys (Philadelphia) asked Mr. Loomis what would be the maximum size of the open burner he would use for the combustion of producer gas, that would keep ignited under all conditions so as to be perfectly safe. He had carried out some experiments in this line, and found that a burner about 2 inches in diameter went out two or three times in two minutes. He also asked how Mr. Loomis could conserve all the hydrocarbons in the coal in the process alluded to. Mr. Loomis remarked that he did not claim that producer gas could be used for private consumption. He talked of carrying it any distance for use on the large scale, but had said positively that he would not distribute it for household use, as he knew the liability of any gas to go out if it had air or nitrogen mixed with it. He was aware that producer gas burnt readily out of a 1-inch pipe; so it might be safe to distribute such a gas, and expect it to burn out of a 1½-inch pipe. Sometimes he made his producer gas and water gas separately, and mixed them afterwards; or if the heat was right, he could produce them concurrently in the same vessel. At some works objection was raised to water gas on account of its high flame temperature; and at others pure water gas was used so as to get the highest temperature possible. He claimed that, using air only, a gas could be made from soft coal that might be conveyed any distance, and used cold with safety as to ignition. It contained from 10 to 12 per cent. of hydrogen. He did not retain all the hydrocarbons in the gas, nor did any one else by any process whatever.

Mr. B. E. Chollar (Topeka, Kan.), next read a paper on "The Purification of Gas from Kansas Coals." The Kansas coal is soft and liable to disintegration on exposure to weather. It contains large quantities of pyrites, not only in layers, but permeating the whole mass; and about 6 per cent. by weight can easily be picked out by hand. The coal is fairly good, yielding, as an average of two years' actual working, 10,200 cubic feet of 17½-candle gas, and 13¾ cwt. of coke of good quality, though high in sulphur, and containing 12 per cent. of ash. But the peculiar feature of the gas is that it contains a large proportion of sulphuretted hydrogen—40 to 75 volumes per 1000; while the carbonic acid is within the usual limits—viz., from 15 to 25 volumes per 1000. The condenser reduces the former to the extent of about 5 volumes, but has no noticeable effect on the latter. The experience in the purification of gas from this coal goes to contradict the popular idea that carbonic acid combines more readily with lime than does sulphuretted hydrogen. The following tests were taken when the gas on the outlet of the third purifier was about to show a foul test with lead paper:—

	Volumes per 1000. H_2S.	CO_2.
Crude gas	48 ..	15
Outlet of 1st purifier	50 ..	10
„ 2nd „	10 ..	5
„ 3rd „	0 ..	3

In the first box the carbonic acid was displacing some sulphuretted hydrogen; but the second box was removing four-fifths of the impurity. The author thought that the smaller quantity of carbonic acid at the second and third boxes might be over-estimated, and also that it was in combination with ammonia. A similar test was taken after turning on a fresh box. No. 2 in the above table was then No. 1, and so on:—

	Volumes per 1000. H_2S.	CO_2.
Crude gas	44 ..	16
Outlet of 1st purifier	12 ..	6
„ 2nd „	8 ..	4
„ 3rd „	0 ..	3

After passing about 200,000 cubic feet of gas, a third test was taken, with the following results:—

	Volumes per 1000. H_2S.	CO_2.
Crude gas	52 ..	12
Outlet of 1st purifier	26 ..	6
„ 2nd „	8 ..	4

After passing more gas, the tests showed—

Crude gas	50 ..	16
Outlet of 1st purifier	40 ..	6
„ 2nd „	8 ..	4

These tests show that the lime takes up the sulphuretted hydrogen more readily than the carbonic acid, and also that a purifier saturated with the former will continue to take up the latter. Some experiments tried by causing crude gas to bubble through milk of lime and caustic soda contained in wash-bottles showed that both of these alkalies would absorb nearly all the sulphuretted hydrogen without touching the carbonic acid; and the carbonates of ammonia and of soda were also found to have a marked effect. With the former, however, the proportion of carbonic acid in the gas was increased. The hydraulic main liquor is free from carbonate, and contains the ammonia almost entirely in the form of chloride. It indicates 6° Twaddel, and about 9 oz. strength by the distillation test. The liquor from the condenser is highly charged with carbonate. It effervesces furiously on the addition of acid, and gives a strong precipitate with acid sulphate of iron. It indicates 4½° Twaddel, and from 5 to 8 oz. strength by distillation. The washer liquor contains chiefly sulphides, but also a fair share of carbonates. It is only 1½° Twaddel; but shows 5½-oz. strength by distillation. A large quantity of water separates in the purifiers by reason of the absorption of so much sulphuretted hydrogen; and for this reason it is usual to put the lime in drier than is generally recommended. The water contains sulphides of ammonia and calcium in solution, and is said to be about 3½ oz. strength. The practical purification of this gas is not so difficult as might reasonably be expected. Thorough washing, and especially scrubbing, greatly reduces the sulphuretted hydrogen. The gas contains a large proportion of sulphur compounds; but the sulphided lime provides for the absorbtion of these. If the purifiers do not act properly, the compounds show themselves at the burners; and they are liable to appear at any time after the first purifier in the series has become inactive. Too much confidence cannot be put in the lead-paper indications at the last box: and it is found safest to work by a sort of rule-of-thumb—finding out by experience the quantity that may be safely passed through each purifier, and taking care not to exceed it, but being also prepared for a change at any time. The preparation of the lime and the charging of the purifiers are carefully attended to; two trays of lime, each 12 inches thick, being found to answer in purifiers of sufficient capacity. The average duty is from 5000 to 6000 cubic feet of gas per bushel of lime, and the cost for lime is 1½d. per 1000 cubic feet. The author concluded with a brief notice of the advantage that would follow the substitution of a liquid ammonia process for lime purification, and the collection of the large quantity of sulphur, which if converted into sulphuric acid would yield more than 100 lbs. of acid per ton of coal.

A paper entitled "Some Thoughts on Fuel Gas, induced from Practical Experience in the Distribution of Natural Gas," was next read by Mr. John Young of Allegheny (Pa.). The full text of this paper has been already given (*ante*, p. 923).

Mr. Denniston opened the discussion by remarking that the paper fully corroborated his previous statement, that it would be a difficult matter to manufacture fuel gas for general distribution. He therefore thought gas managers must be satisfied at present with introducing it to millowners, metal workers, and other users of fuel on a large scale. Mr. Harbison said the statements given by Mr. Young were the most definite he had yet seen. He quite agreed that fuel gas could not be distributed without a large holder capacity. With regard to the estimated cost of 10d. per 1000 cubic feet, companies were to-day supplying fuel gas at 1s. 6d., 1s. 8d., and even 2s. 1d. per 1000 cubic feet, and could not make a cent of profit, but admitted having lost a great deal of money. Mr. R. Young thought it was a mistake to assume that a gas of 400 heat-units per cubic foot could be made to do the same amount of work as a gas of 1000-unit power. Mr. Cornell argued that the fuel gas would be employed more regularly throughout the 24 hours than the ordinary coal gas, which was chiefly used in the

evenings; and therefore that a smaller storeage capacity, in proportion to the make, would suffice. In his opinion there would be no difficulty in providing for the variations in consumption without anything like a sufficient storeage for 24 hours. In basing estimates upon the use of natural gas, it must be remembered that it was supplied at very low prices, and was therefore largely and wastefully used. A high-priced fuel gas would not be consumed to anything like a similar extent. These considerations greatly moderated the difficulties raised by Mr. Young.

(To be continued.)

Register of Patents.

GAS-TAPS.—Baker, R. L., of Manchester. No. 15,294; Oct. 24, 1888 [6d.]

This invention relates to the construction of gas-taps for obtaining a glimmer of light on a burner without danger of extinguishing it when only a small light is required. The patentee's object being to avoid loss of time incurred by the constant turning in and out of gas-jets, especially in large towns where fogs and dark hours occur during the working day; also in workshops, mills, and other places where gas-jets have to be re-lit in the afternoons (after morning use), so saving time and the danger of carrying a naked light. This object is obtained by making a slot or groove in the plug of the tap, and on the face of the plug-seat parallel with each other; so as to allow a small quantity of gas to pass the tap when the plug is in a turned-off position, and thereby leave a small light without fear of its being extinguished.

MANUFACTURE OF ILLUMINATING GAS (THE DINSMORE PROCESS).—Carr, Isaac, of Widnes. No. 16,179; Nov. 8, 1888. [8d.]

This invention has special reference to processes of manufacturing illuminating gas in which tar is introduced into the apparatus, and being gasified is, in conjunction with the gas made from coal in retorts of the ordinary kind, passed through a heated chamber wherein the two gases become "mixed and rendered permanent." The processes in connection with which it is intended the invention should be mainly used are those described in Dinsmore's patents, No. 7714 of 1887 and No. 2096 of 1888.

In these processes the gas, after distillation in the ordinary coal retorts, is caused to pass through a heated chamber or duct, into which tar is introduced in such a manner that it becomes converted into gas in the presence of the coal gas, and mixes therewith. The combined gases are then passed through the heated chamber or duct, whereby they become mixed. In flowing through this heated chamber, some of the hydrocarbon gases and ammonia are liable to become destroyed, says the patentee, if the temperature of the chamber is that equivalent to, or denoted by, a clear cherry-red colour. The prevention of this destruction of gases is the chief object of the present invention.

Fig. 1.

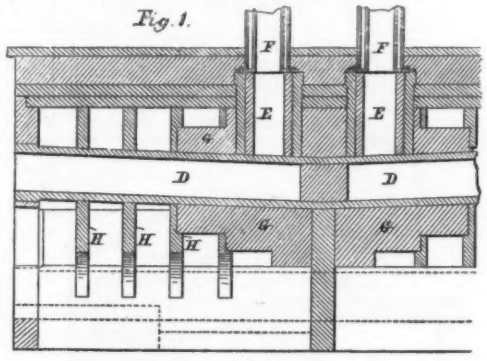
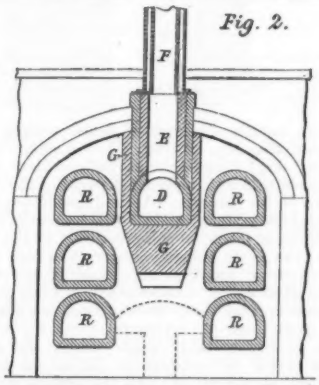


Fig. 2.



For this purpose the patentee proposes to arrange the heated chamber in such a manner that its temperature will vary at different points along its length, and the inner surface (over which the gases pass) will be at only such a temperature as not to affect the gases detrimentally. The point at which the tar is introduced into the chamber or duct is arranged to be maintained at a high temperature, in order to affect the complete vaporization of the tar and fixing of the vapour gases; but the portion of the chamber not required for this purpose is shielded inside or out, with brick or other suitable material in any convenient way, whereby its temperature at a certain point will be maintained at a considerably lower point than the other part. This variation or graduation of the temperature will necessarily be carried out in different arrangements of apparatus in various ways. Then, in lieu of graduating the temperature lengthwise, or in conjunction therewith, the heated chamber or duct may have its temperature graduated at the top or bottom, or sides, by applying shielding slabs or brickwork (such as G) along the top only, or the bottom only, or sides only, in longitudinal strips. The graduation of temperature may also be effected by arranging the various flues or passages of a bench in such a manner that the retort-heating gases act with their full force on some parts, and at others are shielded therefrom. The end at which the gases leave the duct is heated only to a temperature denoted by a dull red colour.

A further effect of this invention is said to be the prevention of stoppages at the outlet of the duct—*i.e.*, at the neck between the body of the duct proper and the cooled outlet-pipe. It will be seen, says the patentee, that if the temperature of the duct at this point is reduced to that denoted by a dull red, the temperature of the body of gases passing through must necessarily be of the same degree of heat; and it is well known that this degree of temperature is insufficient to cause the carbonaceous matter in the gases to become deposited, and thus the outlet is kept clear.

Fig. 1 is a sectional elevation of a bench of gas-making retorts; and fig. 2 is an end section of the setting.

R are the ordinary retorts of the bench; and D is a duct such as is used in the Dinsmore process, and through which the gases from the retorts are passed, as in that process. E is the eduction passage, by way of which the gases leave the duct and flow to the foul main. F is an artificially-cooled pipe on the passage E; this also being such as is used in connection with the Dinsmore process. G designates a body of brick, tile, or their equivalent, by which the rear end of the duct D is shielded, and by which that end is maintained at (say) a dull red heat. H are division walls, by which the duct is supported in position.

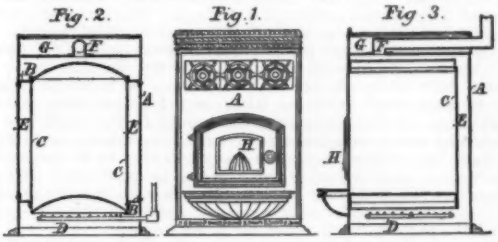
By this construction, as already mentioned, the front end of the duct is maintained at a high temperature, the tar is effectively distilled, and the desired union of the tar and coal gases from the retorts is caused to take place. In their passage through the portion of the duct shielded by the material G, all injury, which might otherwise take place, is obviated, with the result already mentioned; the combined tar and coal gases being claimed as both "permanent and homogeneous."

GAS-COOKING STOVES.—Shiels, A., of Glasgow. No. 18,733; Dec. 22 1888. [6d.]

This invention has for its object to so construct gas-stoves that the fumes arising from the combustion of the gas shall not have access to the compartment in which the food is being cooked or heated.

The stove consists of an outer enclosing casing or shell A, in which is supported on brackets B an inner shell or casing C, which constitutes the oven or heating compartment of the stove. This inner chamber, which may be made slightly dome-shaped at its upper end, is also, by preference, dished or concaved at its lower end, as shown in fig. 2, so

Fig. 2. *Fig. 1.* *Fig. 3.*



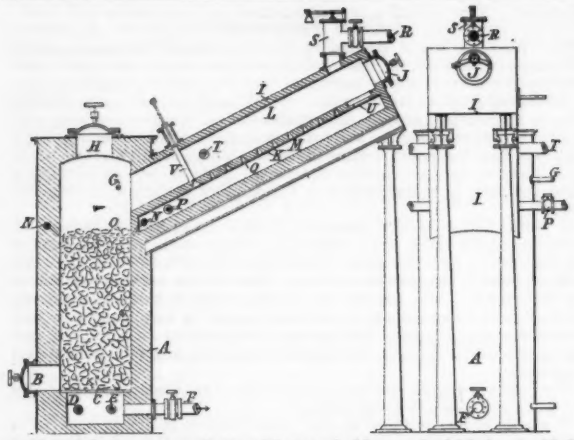
that the greatest possible heating surface may be obtained. A ring of gas-jets D is so fitted in the outer casing, or attached to the cooking compartment, that the flames play on to and heat the bottom of the cooking compartment; the products of combustion passing up the annular space E between the outer casing C and the inner casing to the exit-flue F, which is, by preference, placed near to the front centre of the top of the stove, as shown in fig. 3, so that the heated products of combustion must, before escaping, circulate round the inner shell. A hot-air space G is, by preference, left at the upper end of the stove. From fig. 3 it will be seen that the inner casing C is fitted at its front end to the outer shell A; and at this part the door H is situated.

MANUFACTURE OF GAS.—Pitt, S.; communicated from C. B. Harris, of New York City. No. 14,291; Sept. 10, 1889. [8d.]

The principal claim for this invention is for a gas-making apparatus consisting of a combination of generator provided with air and steam pipes; or inclined coking chamber connected to and communicating with the generator, and provided with a perforated diaphragm; a conduit communicating with the generator chamber and with a space below the diaphragm, and adapted to conduct the products of combustion from the generator to the said space; and a cut-off or damper, to prevent direct communication from the generator to the upper part of the retort.

The illustration [next page] shows a vertical section of the generator and coking chamber, and a view looking toward the outer end of the chamber.

A is the generator, made of brick, enclosed by metal, and provided with a door B and grate C, and having in the ash-pit an air-inlet D, a steam-inlet E, and a gas-outlet F. In the upper part of the generator is a steam-inlet G. The charging hole H is sealed in any usual manner. Communicating with the generator is an extension I, styled a "coking chamber," into which fresh coal is charged through a door J, that can be closed gas-tight when desired. This extension is about 3 feet wide by 2½ feet in depth; and the generator is about 4 feet in diameter, and about 10 feet in length. The coking chamber is provided preferably below its central plane with a perforated diaphragm K, dividing its interior into a coal chamber L and a combustion chamber M. The latter communicates with the generator by means of an annular flue N having openings O into the same. P is an air-inlet; Q passages through the diaphragm; R a gas-outlet connecting through a water seal with a scrubber and holder; and S an outlet for waste or producer gas, which



may be made to communicate with a gasholder, and which is provided with a cover that can be made gas-tight when necessary. T is a modification of the retort in respect to the gas-outlet; and U a damper which may be used in connection therewith. V is a damper or cut-off, which serves to prevent gases from the generator passing directly into the retort, and compels them to flow into the annular flue, and thence into the combustion chamber M. This damper also serves to prevent the fresh coal from sliding or rolling down into the generator, particularly when the retort is much inclined. The inclination (illustrated) of about 1 in 3 is said to be a very suitable one.

In operating the apparatus, the generator is first charged with coke or anthracite coal, which being ignited is raised to incandescence by an air-blast introduced beneath the grate. The products of combustion enter the annular flue N, and pass thence into the combustion chamber M, where they may be more completely burned by admission of air through the inlet P. The hot gases pass through the perforated diaphragm and out of the exit S. Fresh coal may be charged into the retort either before or after the above-described step. If charged previously, the products of combustion which pass through Q and through the coal are partly decomposed; and the carbonic acid is converted into carbonic oxide, and somewhat enriched by the coal gases, particularly if the air supply in the chamber M does not exceed the amount required to convert the producer gas into carbonic acid and water vapour. When the coke in the generator has been rendered incandescent, the air supply is cut off, and steam is admitted and passed up through the hot coal of the generator, which decomposes it and produces water gas. This gas passes into the lower chamber of the retort, and through the perforated diaphragm. The air supply to the lower chamber having been cut off, the outlet S closed, and the gas outlet R opened, the water gas is passed therethrough to the holder. If the retort be charged with fresh coal after the air blast below the generator grate is cut off, and before the water gas is passed through the retort, it serves to enrich the latter; air, of course, being excluded at every point. If the producer gas is burned in the retort, and the carbonic acid thus produced not reconverted into carbonic oxide as set forth above, the products are waste gases and may be discharged into the open air or used to heat regenerators in the usual way; otherwise they may be conducted to the boiler or other furnaces and burned while hot. Preferably the fresh coal is charged at a time when it will operate to enrich the water gas rather than the producer gas.

Stop-Indices for Prepayment Gas-Meters.—Valon, W. A., of Ramsgate. No. 14,312; Sept. 11, 1889. [6d.]

This is an improvement on patent No. 10,598 of 1889. It is in part for the same object—namely, to so construct dry gas-meter indices that

Fig. 1.

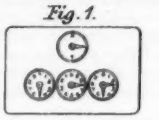


Fig. 2.

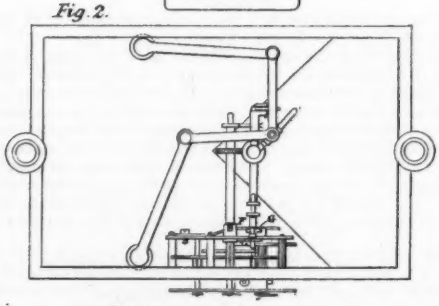


Fig. 3

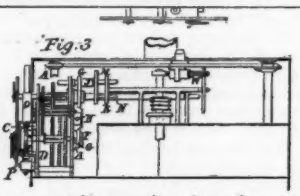


Fig. 4.

immediately after a certain quantity of gas has passed through the meter, the index and consequently the meter will stop, and the supply of gas to the fittings beyond will be cut off.

Fig. 1 is a front elevation of the dial-plate of a dry gas-meter index. Fig. 2 is a plan of the index and the upper part of the meter. Fig. 3 is a side elevation, with the side plate and part of the valve-box removed. Fig. 4 shows an alternative arrangement for stopping the meter, and therefore the registration.

In carrying out this invention, the index is made with a spindle A, a projecting pin C, a disc D, with a notch (shown in the drawing fig. 3 in deep black) just the same as described in the former patent; but, instead of placing the spring F and arm or lever G as there mentioned, the spring F, and a different form of lever G, are placed behind the back plate of the index. The lever G is pivotted at H to a support I, fixed to the back plate of the index; and it is pressed against the end of the spindle A by the spring F. The upper part of the lever is forked (as in fig. 2), and fits a recess in an arm J, one end of which slides through a hole in the back plate of the index, and the other end through a hole in the upper part of the guide-piece K. This guide-piece is supported by the bar L, and short standards fixed to the top of the valve-box. The sliding arm J has a cross-piece M fixed to it; and this arm carries a pin N, which slides through a hole in the lower part of K. Both the end of the arm J and the pin N, therefore, work through holes in the guide K. When therefore the registering pointer O has reached the same position as the adjustable pointer P, the spring F will press the end of the spindle A, and consequently the pin C, into the notch; and at the same time it will cause the bar J to slide towards the back of the meter, and so bring the cross-piece M into such a position that it catches the tangent screw as it revolves, and so stop both meter and index. In the resetting of the pointer P by applying a key to the square end of the worm spind'e Q, the pin C is driven out of the notch in the disc D; and the end of the spindle A forces the lower end of the lever G so that its upper end draws forward the cross-piece M, and so relieves the tangent screw, when the meter is again free to work.

In fig. 4 is an alternative arrangement for stopping the meter. In this case the pin C is fixed to a disc D attached to the worm-wheel; and the inclined notch shown in deep black is formed in the clutch E, which is keyed or pinned to the shaft or spindle A.

Gas-Making Apparatus (Arrangement of Inclined Retorts).—Kitt, A., of Lupus Street, Pimlico. No. 14,881; Sept. 20, 1889. [8d.]

The object of this invention is to effect the charging and discharging of gas-retorts by making use of what the patentee describes as "the old and known plan of inclined retorts, so that the charging and discharging may be effected by gravitation."

Fig. 1.

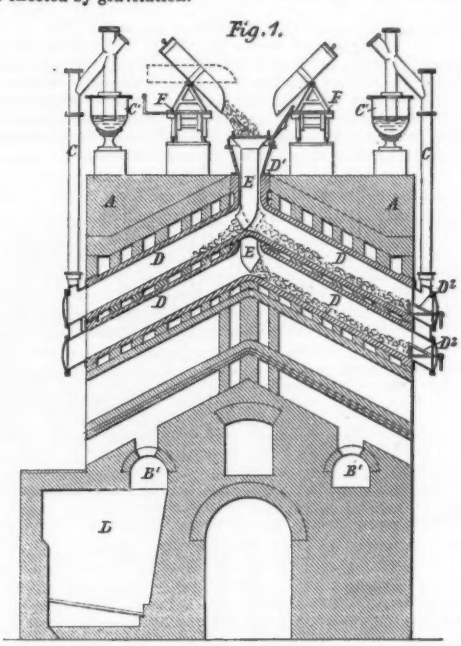


Fig. 1 is a cross section of a bench of double retorts with these improvements adapted thereto; and fig. 2 is a similar view, showing a slight modification. Figs. 3 and 4 are partial end views of the setting, showing two arrangements for supplying the coal to the retorts.

A is the setting; B, the furnace; B^1, the heading passages from the furnace; C, the ascension-pipes; and C^1, the hydraulic main or mains—all of which may be of the usual construction. D are the retorts, of inverted Y-shape; the arms D being longer than the stem D^1. The retorts have thus three mouthpieces—namely, one at the end of either arm D (the discharging mouthpieces), and one at the stem (the charging mouthpiece); and these mouthpieces are closed by vertical covers for the arms and a horizontal cover for the stem. The arms D are set at any suitable angle which will allow the coal to run or slide down by gravitation, so as to leave an even layer on the bottom of the retort; and the covers may be provided with stops D^2 to arrest the fall of the coal, and retain it in position in the retort. In fig. 1 the ascension-pipes C are connected with the lower ends of the retorts; but in fig. 2 with the stem D^1—in both cases two hydraulic mains being preferably provided. The charging of the retorts is effected by means of a funnel E or shoot, with a curved or bent lower end. This is let down into the stem portion D^1; and guides the coal to either arm of the retort, according to the direction in which the bent mouth is turned, as shown in the drawings. The funnel E receives the coal from trucks F, which run upon lines of rails arranged along the top of the setting; the charging mouthpieces being in a line along the centre of the setting for the purpose. It may, how-

Fig. 2.

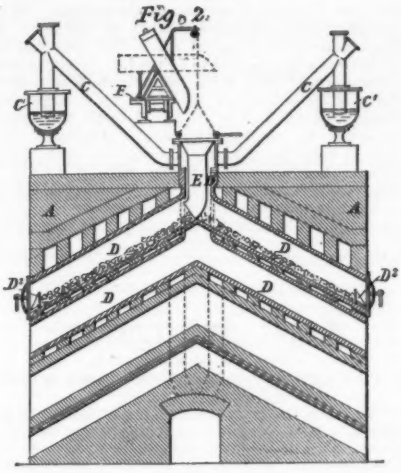


Fig. 3.

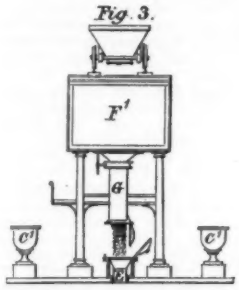
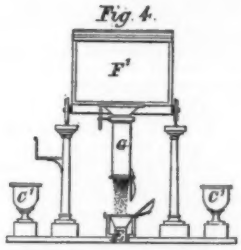


Fig. 4.



ever, be supplied from a fixed or moveable coal hopper F^1, as shown in figs. 3 and 4. Means, are, of course, provided for hoisting the funnel out of, and lowering it into the charging mouths.

Referring now to fig. 3, F^1 is a coal hopper or store, supported on columns arranged on the top of the setting. This coal hopper is filled by trucks from (say) the collier; and it may be provided with a shoot G for each charging mouthpiece of the benches of retorts. These shoots are closed at the bottom by a door, and are of such a size as to contain the proper amount of coal for a charge; a screw door or other means being provided to shut off connection with the hopper when the shoot is full and ready to be discharged.

In fig. 4, the coal hopper or receptacle is shown mounted on wheels, so as to run on rails carried by columns. The hopper is provided with a shoot G, which may be detachable, so that the hopper can be lowered into the collier or barge to be filled with coal.

In the course of his specification, the inventor remarks: "It will be seen that, by my invention, the charging and discharging of the retorts is effected by gravitation; and the coal being stored in hoppers or receptacles above the setting, instead of on stages in front, the labour of charging is greatly diminished. It will be evident that, if desired, the measuring shoot may also be made to travel, so that one shoot may be made to serve one or several benches of retorts. The shoots may also be arranged at the sides of the hoppers. By the use of a travelling hopper, I am enabled to convey a quantity of coal sufficient to charge at least one bench of retorts; and thus save not only time and labour, but plant. Although the Y-shaped retorts are shown inverted in the drawings, they may be used the right way up; the central mouths being used as discharging, instead of charging mouths."

APPLICATIONS FOR LETTERS PATENT.

18,065.—Kempton, C., Senr., "An improved consumer for gas and other lamp globes or shades." Nov. 12.

18,092.—Carnaby, S., "A gas-distributing governor for heating and lighting gas." Nov. 13.

18,100.—Greenhill, M. C., "Improvements in and relating to apparatus for the automatic delivery and distribution of illuminating gases." Nov. 13.

18,130.—Andrews, J., "Improved tap and valves for steam, gas, water, and other liquids." Nov. 13.

18,163.—Pritchard, F., "Enriching and increasing the volume of gas obtained from coal, and the utilization of waste heat from retort-settings." Nov. 13.

18,227.—Mohs, J., "An improvement in gas-engines." Nov. 15.

18,258.—Okes, J. C. R., "Improvements in gas-engines." Nov. 15.

18,260.—Melhuish, A. G., "Improvements in gas or hydrocarbon vapour motors." Nov. 15.

18,302.—Hale, E. H., "An improvement in gas-fires." Nov. 15.

18,319.—Key, J. T., "Improvements in and apparatus for utilizing inflammatory gas for raising steam in steam-boilers and for other purposes where heat is required." Nov. 16.

18,357.—Clarke, C. L., and Briggs, A. B., "Improvements in apparatus for lighting gas." Nov. 16.

Battle Water Supply.—The Battle Local Board are considering plans for the improvement of their water-works, and have resolved to apply to the Local Government Board for a loan to enable them to carry out their proposals. From the estimates submitted to them, it is considered that £1000 will about cover the present necessary expenditure.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE SOUTH METROPOLITAN WORKMEN'S PROFIT-SHARING SCHEME.

Sir,—The 1000 men who have signed agreements under the profit-sharing scheme you recently published were requested to select 10 per cent. of their number, as representatives, to meet the Directors and discuss the question as the first step towards the formation of the Working Committee. About 100 men attended on Thursday last.

The first word was an appeal for mutual confidence, which was most heartily responded to. This was the key-note of the entire discussion, which lasted over two hours without a single jarring note. Speaker after speaker gave utterance to words that did honour to themselves and to the men, who enthusiastically cheered their sentiments. This was most gratifying to us, as proving the loyalty of the men to the Company, and their appreciation of the manner in which they have been treated. I must say that, of all the meetings of working men at which I have been present, not one has pleased me so much as this, or has shown more clearly how much of good there is in their class; and, in saying this, I wish to add that, although the stokers did not take part in the meeting, I have not ceased to believe that they (being drawn from a somewhat similar class) are capable of manifesting the same good feeling.

All the men who have signed the agreements accepted without question the clause entailing forfeiture of the whole of the money standing in their names should they strike or do wilful injury to the Company. This, however, we now consider unnecessary; and so have withdrawn it, believing that the less the profit-sharing scheme is hampered by restrictions, the more harmoniously it will work to the mutual advantage of employers and employed.

George Livesey.

South Metropolitan Gas Company,
Old Kent Road, Nov. 22, 1889.

P.S.—A full report of the above-named meeting has been printed; and anyone desiring a copy can have it on application to Mr. Bush, the Secretary of the Company.—G. L.

IS WATER GAS POSSIBLE FOR BRITISH GAS-WORKS?

Sir,—No doubt those who have water gas patents for sale (of which there appears to be a fair crop) will hail with joy your sudden conversion to water gas; but as sudden conversions are often evanescent, we may yet have the pleasure of seeing you turning another somersault at no distant date. I repudiate the construction you have been pleased to place on my reply to the criticism passed on my water gas paper at the last meeting of the Midland Association of Gas Managers. A reference to my remarks, as reported in your issue of Nov. 12, will show with what truth you say I made "a definite, unmistakable, and uncompromising statement of the case for the indefinite exclusion of water gas from British gas-works;" also the charge of being "too sweeping when he was laying down the law of the eternal inadmissibility of water gas in England." Now, without being too prolix, I will endeavour to give a few concise extracts, which fairly represent the gist of my remarks.

In the first place, I informed the members that it was my desire to treat the matter impartially; and I then corrected my statistics so far as they referred to the selling price of water gas, because I had taken them from a paper which was not up to date, and hence placed water gas at a disadvantage. My reply to Mr. Charles Hunt's apt criticism with reference to a mixture of carburetted water gas and coal gas being a reality in the future, was: "It might be some day; but at the present time it is not practicable." Later, I pointed out that "it is more economical to make coal gas in retorts than to make the water gas as now proposed." This, of course, refers to illuminating gas, and to the present time, which I shall once more demonstrate is a fact so far as English gas-works are concerned. Again, I said: "In England, it might be possible to distribute water gas for heating purposes alone, if use could be found for the bulky producer gas; but I do not see that it is possible to distribute carburetted water gas, on account of the cost of carburetting." I concluded by agreeing with our President-elect, Mr. Peaty, that it is a matter of "£ s. d.;" and that if we could make water gas cheaper than coal gas, the thing would be entirely different, but I found that its cost was higher.

So much then for that part of your article in which you make me appear a fanatic, as utterly opposed to water gas under any circumstances. I have freely given my opinion on water gas, backed with reasons; and I have taken every opportunity—short of visiting America—to make myself well acquainted with the subject.

I dissent from your statement that a number of water-gas plant manufacturers of repute will guarantee a duty of 1000 cubic feet of 26 or 27 candle power gas from 45 lbs. of ordinary gas coke and 4½ to 5 gallons of crude Lima oils. To be more correct, the figures given me are 42 lbs. of coke, and 4½ gallons of crude Lima oil for each 1000 cubic feet of 20-candle power gas. In passing, it may be well to mention that a large number of the water gas companies in America do not use the low-grade oils for carburetting, which the bare possibility of obtaining at cheap rates in this country appears to have been sufficient to make you take a sanguine view of the subject. I have gone to the trouble of inquiring from a firm, who are the owners of numerous Transatlantic liners, what their opinion is as to the probability of our getting crude oil in tank-steamers from America at 10s. per ton for freight, dues, &c., delivered at English ports; and they reply as follows:—

"We certainly do not think anyone in these times would look at 10s. per ton on oil from the States to the United Kingdom. Present rates are about 2s. 4½d. per barrel of 5 barrels to the ton. This gives the rate as about 12s. for freight alone. Liverpool dues are 1s. 8d. per ton; and quay charges, 1s. 4d. We doubt whether it would come any cheaper in tank-steamers; as, against the additional quantity they could carry, must be placed the expense of fitting, and their unfitness for any other trade. The main factors in fixing rates are bulk as compared with weight."

Your readers can now form their own opinion as to what prospect there

is of their being able to purchase low-grade oil delivered at 1d. per gallon.

Turning now to your figures as to the cost of making 20-candle power water gas in England. He would be a bold man who would calculate at less than 2d. per gallon; and 4½ gallons of crude oil at this low price means 9d. for carburetting. Add the cost of 42 lbs. of gas coke at 10s. per ton (not 6s.) equals 2¼d. for fuel; and we have 11¼d. as the cost for raw material alone for each 1000 cubic feet of 20-candle gas. This is rather different from your 6·4d.; but new converts are generally enthusiasts. It appears to me very questionable whether 1s. per 1000 cubic feet would pay for raw materials in actual practice; and I am strengthened in this opinion by reference to cities in America where low-grade oils are used, and yet the price charged for gas varies from 6s. 3d. per 1000 cubic feet upwards. The candle power varies from 20 to 26 candles; and it may be argued that possibly the companies are making large profits. However this may be, the wide difference between 6s. 3d. for New York water gas and 2s. 6d. for London coal gas, does not bear out your low figure; and a reference to the stock quotations of New York and London Gas Companies further strengthens my view.

With reference to M. Coze's system of inclined retort-settings, and the wonderful possibilities of combining this plan with a water-gas generator, you seem to have overlooked the fact that the producer gas is required to heat up the fixing chamber, in order to gasify and fix the hydrocarbons of the oil; and thus it cannot well be used for two purposes, even if adapted for retort heating.

No doubt, at the present time, it is much cheaper to make coal gas in closed retorts, than carburetted water gas. But I am not going to presume to prophesy what may be in the future. It must be left to each individual engineer to decide whether the circumstances of his case are such as to justify the erection of water gas plant in order that he may be in a position to make a large quantity of gas quickly in case of fogs, &c., as well as to use same as a threat to his workmen that, unless they adopt his dictum of what their labour is worth, he will try and do without them. Well, I am of opinion that Mr. G. Livesey's policy of kindness, justice, and mutual interest will, in the end, be more successful than coercion.

I hope the next time you treat your readers to a water gas homily, and give me the benefit of your criticism, you will at least not put a construction on my remarks which they do not convey, and for which I am not responsible.

Stafford, Nov. 22, 1889. J. Ferguson Bell.

[Our correspondent is somewhat warmer than the terms of our references to his previous statements require. We might, with more reason, protest against the application of the words "somersault," and "homily," and return the charge of misconstruction with reference to an article in which the sincerity of Mr. Bell is fully acknowledged, and which is explicitly stated to have been intended "to show that the argument is not all on one side." As for our figures, we gave them subject to correction; and our readers must judge whether reason inclines more to Mr. Bell's side than to ours.—Ed. J. G. L.]

PEASE'S PATENT GASHOLDER GUIDING.

Sir,—I see you state, in your issue of the 19th inst., that we intend erecting a new gasholder on the principle invented by Mr. Pease. I may say, for your information, that we have converted an 80-feet single-lift holder into a two-lift one on this principle; and that so far it is working satisfactorily. I shall be pleased, at any time, to give you any information respecting same, or show it to you or any of my brother gas managers.

Haslingden, Nov. 23, 1889. W. H. S. Gendall.

THE DANGERS OF ELECTRIC WIRES.

Sir,—It is rather amusing to see how arguments on technical points are often based on the newspaper report of an interview with Sir Somebody or other or Lord Bigwig. Your correspondent, "W. M.," in the Journal for the 19th inst., writes on a subject which has been pretty fully threshed out in Board of Trade inquiries, and has been accepted by those most interested to have been "squared." It is, among other things (such as the possession of a 42-feet diameter armature dynamo), the proud boast of the Engineers of the Grosvenor Gallery scheme, under the leadership of Mr. Ferranti, that in no single instance has there been an accident to their extensive overhead network of electric light leads. The engineering construction of the large spans of cable on the housetops was carefully considered as being one of the principal points in the system of lighting started by the then Company of Sir Coutts Lindsay, Limited. It is also an acknowledged and generally accepted fact that if overhead wiring is done in the manner in which most engineering structures are usually carried out, there is no danger of anything occurring such as would lay the foundation for sensational newspaper paragraphs like those lately edifying the English public regarding New York, where a wire "spluttered and fizzed" for half-an-hour after it was severed from the general canalization. It is also rather good to quote Mr. Edison in this matter. I wonder if "W. M." has ever heard the story of Mr. Harold P. Brown and his challenge to Mr. Westinghouse to have a duel *in propriâ personâ*, and, by trial, test the effect of high *versus* low tension currents. If so, he ought not to quote the renowned wizard of Menlo Park as an authority on the real and unvarnished opinion of the dangers of overhead wires.

It is well known that electrical "insulation" is a relative term, and that the deterioration that sets in when a system of conductors or canalization is taken into use, is gradual after a fixed period, during which the value for leakage has been decreasing. With good materials, this fall is very slow; with inferior materials, more rapid. But, in any case, it is only a question of time; and, like everything else in this mundane sphere, the whole can only be repaired "with a new one." The New Yorkers, with their usual smartness, have been in such a hurry to get the electric light, that they have not had time to put up good material. Indeed, one of the companies there is intending to discard the whole of its system lately in use, and put up an overhead system with, to say the least of it, decent material. In London, too, the whole network will be underground; and the only danger to be feared is that to the *employees* of the supply companies themselves. Of course, any fault will probably endanger the constancy of the light; but that is not, in itself, an element of personal risk. Not only this, but though as high as 10,000 volts is proposed to be used, it is not intended to take even the intermediary, or 2500 volts, into private houses as at present, where transformers are individual suppliers; but a large converter will be used to supply a group, and be, in fact, a small, noiseless, smokeless generating station so far as the consumer is concerned. Only 100 or 110 volts will then enter the consumers' premises; and, though unpleasant, this voltage is not in the least dangerous.

To the latter part of the letter of your correspondent, it is hardly necessary to say more than that the whole story, as it appeared in the papers, was a "goblin" one, and evidently puffed up to a tremendous extent.

Liverpool, Nov. 20, 1889. Charles H. Yeaman.

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Wednesday, Nov. 20.

(*Before the* Lord Chief Justice *and Mr. Justice* Mathew.)

HOLME AND KING *v.* HAWARDEN WATER-WORKS COMPANY.

This was an appeal by the plaintiffs against the judgment of the County Court Judge at Chester, in an action to recover damages in respect of an alleged breach of agreement. The plaintiffs are engineers and contractors carrying on business at Liverpool; and the defendant Company was incorporated in August, 1883, for the purpose of constructing water-works in the neighbourhood of Hawarden. Tenders were invited for carrying out the works; and the plaintiffs' price of £11,000, for the construction of a reservoir and laying all the necessary pipes, was accepted. The Company did not obtain as much capital as they expected, and resolved to reduce the size of the works; and accordingly notice was given to the plaintiffs that the contract would not be carried through. The plaintiffs stated that they had commenced the works, and claimed compensation. After some negotiation, a letter was written by the plaintiffs stating the terms on which they would give up their claim and carry out the lesser scheme, which comprised a service reservoir and a smaller line of pipes. The Company agreed that all works to be done for them within the next five years should be given to the plaintiffs; and the question which now arose was as to the meaning of this agreement. After the plaintiffs had completed their contract, the Company proceeded to put in branch mains to different villages, and also to increase the size of the reservoir. The cost of these works amounted to £540. The plaintiffs contended that they ought to have been employed to do the work; while on behalf of the Company it was said that no work had been carried out for them—they having done it themselves. At the trial in the County Court, the Judge found that the works did not come within the terms of the letter which constituted the contract between the parties. The Company admitted that it was impossible to carry out the larger contract owing to the want of funds, and that a new contract was entered into; but they said the meaning of the letter was that if the larger works were carried out within the next five years the plaintiffs should be employed to do them. They never were carried out; and those now in question formed no part of the original contract, and were not works *ejusdem generis*.

Mr. Carver appeared for the plaintiffs; Mr. Lloyd represented the Company.

Their Lordships held that the County Court Judge had properly construed the contract; and dismissed the appeal, with costs.

WESTMINSTER COUNTY COURT.—Thursday, Nov. 21.

(*Before Mr.* F. Bayley, *Judge.*)

THE GASLIGHT AND COKE COMPANY *v.* HUNT.

In this case the Company sought to recover from Mr. *James Hunt* £4 4s. 2d. for gas supplied to the defendant as Secretary of the Bruno Building Society.

The Solicitor for the plaintiffs handed in a memorandum of agreement, signed by the defendant, and dated in December, 1887, in which he undertook to be personally liable for all gas consumed by or on behalf of the Society.

Defendant said he should object to the agreement being put in, inasmuch as it was not legally stamped, and was therefore invalid.

His Honour examined the document, and overruled the objection.

Defendant was then called, and admitted that the document was signed by him on behalf of the Society, but not that he was to be personally liable. Moreover, the plaintiffs had, he said, made a demand on the Society for the money, and, failing to get it, had fallen back on him.

His Honour said this did not matter. It was obvious that the defendant, in signing the agreement, had made himself personally responsible to the Company. There would be judgment for the amount, with costs.

Defendant said he could not pay the whole amount down; and accordingly an order was made for two monthly payments.

Oriental Gas Company, Limited.—In the Journal last week, we noticed briefly the financial results of the working of this Company in the year ending June 30 last, as stated in the Directors' report for this period. We learn from the same source that the position of the Company has been maintained. Owing to the exclusive use of coke as fuel in the retort-houses, the receipts from the sale of this residual were lower in the past, as compared with the preceding financial year; but this was counterbalanced by a considerable decrease in the consumption of coal, and by improved returns from tar. Exchange was very unfavourable throughout the year, and occasioned an increased charge upon the profits. The public lighting was augmented to the extent of 45 lamps—19 being in Calcutta, 25 in the suburbs, and 1 in the Maidan; and orders have been received for the erection of a further number of 320 lamps in the city and suburbs. The total number of new private consumers obtained during the year was 157, representing 1333 lights. The Engineer (Mr. D. Coats Niven) reports the works and apparatus generally to be in good order. Owing to an abundance of suitable native coal, the Company are unaffected by the large advance in the cost of this material and freight which has occurred elsewhere; and arrangements have been made for a supply of a portion of the requirements for a period of three years at a reduced rate. Since the previous report, the Directors have lost a colleague by the death of Mr. J. R. Peill, whose place at the Board has been provisionally taken by Mr. E. Garey, formerly one of the Auditors, whose duties have been discharged by Mr. R. Hesketh Jones. These alterations in the *personnel* of the Company will, of course, come before the shareholders for confirmation at their meeting to-morrow.

Miscellaneous News.

GAS WORKMEN AND THE LABOUR QUESTION.

In connection with the movement initiated by the Directors of the South Metropolitan Gas Company for the settlement of the labour difficulty, it will be of interest to reproduce the following statement, which has been issued by them to the stokers and retort-house men:—

The Directors feel that the relations between employers and employed are not in a satisfactory condition; and they think the workmen must feel the same. Under these circumstances, a plain statement of facts may do good.

They can refer to their past dealings with their men with confidence, to prove that it has always been their wish to act fairly, and to make the conditions of employment more favourable than those generally to be obtained elsewhere.

The sick and superannuation funds were established solely for the benefit of the men—the former to provide 12s. a week and medical attendance during sickness for 13 weeks, which is almost always continued in necessitous cases for another three months; and the latter to provide pensions of from 10s. to 16s. a week, according to length of service, for the members when no longer able to do a fair day's work. The subscription to each of these funds is 3d. a week, which is not nearly sufficient to provide the above-named benefits. The funds are, therefore, a heavy cost in money to the Company, and their administration involves considerable trouble; but the money is cheerfully given, and the trouble gladly undertaken, under the impression that the men derive benefit therefrom. The rules of those funds may, perhaps, be improved; and as soon as good feeling is restored, the Directors will be glad to meet the men to discuss the question.

This Company was the originator of the annual week's holiday, with pay, about 25 years ago, on the recommendation of the late Thomas Livesey, who also started the sick and superannuation funds. Some years ago the holiday pay was doubled to servants of three years' standing; it is therefore now practically the same as a fortnight's holiday with pay.

The Company also took a prominent part in the abolition of Sunday labour in gas-works between 6 a.m. and 6 p.m., and was one of the first to grant this boon to their men, quite unsolicited, as were all the other privileges above named.

The change from the twelve to the eight-hour shift had been proposed by the Company in 1887, and also in 1888, but it was not then taken up by the men; but when, in June of this year, the stokers asked for the change, it was immediately conceded. The new arrangements as to work and wages were made in a liberal spirit, which the men accepted readily; and many of them expressed their satisfaction, and even went so far as to say they had been dealt with more liberally than they expected.

The wages of stokers engaged in charging and drawing the retorts ranged, under the twelve-hour system, from 5s. 2d. to 5s. 6½d. per day; while, under the eight-hour system, with a very considerable reduction of work, their wages range from 5s. 4d. to 5s. 8d. per day, which, for the time they actually work, is equal to about 1s. an hour, because out of the eight hours they have nearly, if not quite, three hours for meals and rest, and in addition to their wages the stokers receive 1s. 6d. a week as "good time" money.

This settlement, which in cost to the Company is equal to an increase of more than 25 per cent. in retort-house wages, has not been acted upon by the men in that spirit of fairness which the Directors had a right to expect; but constant objections have been made and new claims put forward which are fatal to amicable working. As far as possible, the requests of the men for modifications of the agreement have been granted; and the Directors and the Engineers and Foremen have every desire to act in a spirit of fairness and consideration at all times.

The last difficulty raised by the Union (for, as a matter of fact, no complaint or request on the subject was made by the Company's men) is the question of the rate of pay for Sunday work when carbonizing, which was settled in June last at time-and-a-half from 6 a.m. to 6 p.m.; and the men distinctly stated that they asked for nothing extra beyond those hours. A demand has now been made for double time for all work done by stokers, firemen, coal trimmers, and pipe cleaners between the hours of 6 a.m. and 10 p.m. on Sundays.

The Company has, in the matter of Sunday labour, as in all other points, kept to the agreement faithfully and honestly. No carbonizing has been done on any Sunday at any station from 6 a.m. to 6 p.m. since the new arrangement came into operation. The Directors and officers of the Company are quite as anxious as the men—perhaps more so—to reduce Sunday labour to the utmost extent possible; and they feel that it is unfair on the part of their men to have adopted this resolution.

If there is any hardship in the agreement or in the system of working, the only right and manly way is for the men to meet the Directors or the officers of the Company in friendly conference to discuss the point, and by mutual agreement to meet the difficulty; and, as has been repeatedly stated, the Directors and officers will always endeavour to deal liberally with all reasonable requests.

The Directors do not consider that, on this question of double time from 6 a.m. to 10 p.m. on Sundays, the opinion of the men has been fairly taken. Of course, when a large body of men are asked to hold up their hands in a mass meeting in favour of such a demand, they naturally prefer that which they consider best for themselves. If an amendment had been proposed in the same way for treble time, no doubt they would have carried it unanimously. There is only one fair way of taking the men's opinion, and that is by ballot; and for the honour of the men, the Directors refuse to accept an opinion taken in any other way, because they do not believe that the men's honest view of the matter can be obtained by a show of hands in a mass meeting.

Objection has been made to turn out on Sunday evening at 6 o'clock for half a shift for ordinary pay; but the men must remember it was their own proposal, and the consequence of the eight-hour movement. However, to show that the question will be met fairly, the Directors make the following offer:—They will endeavour to stop carbonizing from 6 a.m. to 10 p.m.; and when it is necessary to work, time-and-a-half shall be paid for all carbonizing work done between 6 a.m. and 10 p.m. on Sundays. The Directors will grant this cheerfully as a permanent concession; but if the men persist in their unreasonable demand for double time from 6 a.m. to 10 p.m., the Directors can only regard it as a breach of the agreement, and a declaration of hostility by the men. As a fair way out of the difficulty, the Directors suggest that a ballot should be taken at all the stations of the Company, to obtain the views of the men on the question.

The certain result of unreasonable demands on the part of the men will be the adoption of machinery and labour-saving appliances of all kinds; so that within two years, at the outside, a large proportion of the men now employed will be displaced thereby, if they continue unreasonable. The Directors and officers of the Company have no wish to see the men deprived of their employment, and will do everything in their power to maintain a kindly feeling. They feel, however, that it is true kindness to state clearly what will inevitably happen if the stokers persist in their present course.

In the past it has not been worth while to apply machinery extensively for charging and drawing the retorts, because there was not much saving; but now that carbonizing wages have been increased 25 per cent. or more (and further demands are talked of, and some have actually been made), the saving by the use of machinery will be very considerable. The information already obtained on this subject shows that at large gas-works in America, where machinery was introduced in consequence of labour troubles, and where it is in successful working, 20 men make as much gas as 75 do here. There are also new systems of gas making which are in practical work in many places, of which the principal feature is the very small number of men required. If the men act fairly, although machinery and the other plans referred to will, no doubt, be adopted to some extent, it will be done gradually; whereas if they go on as they are now doing, the Directors will be compelled to introduce labour-saving appliances into every retort-house with all speed.

A word about the profit-sharing proposal which the Directors are glad to find has been accepted, and agreements signed by nearly 1000 men of all classes in the Company's employ, some of them being Unionists, which proves that service under the Company is regarded as worth having. Those agreements not only bind the men to serve the Company faithfully, but they also bind the Company to be faithful to the men, and to protect them under all circumstances, and at whatever cost, in the performance of their duties. There appears to be a misunderstanding on the part of some of the retort-house men on the subject. No one even thought of suggesting that any man, as a consequence of accepting, should leave the Union; on the contrary, men who accept are perfectly free to remain members of the Union if they choose. The Directors were prepared to defend the Company should the stokers enter upon a strike; for it must not be supposed that, after the action of the men on the 20th of September, the Directors so failed in their duty as to neglect taking precautions against a repetition of that act. They, in fact, faced the question and counted the cost. It was then suggested that it would be better to devote money for the benefit of the men to show them that we wished to be their friends, and to endeavour to make them our friends, than to spend it on a fight; and the profit-sharing proposal was the result. The most satisfactory proof that the scheme is fair and to the advantage of the men is the fact that it has been accepted so quickly by such large numbers, and has been so heartily and spontaneously approved by the public and the press. The offer was and is made to the regular men in the first instance, who are perfectly free to decline it if they think fit. Others are showing how they value service under the Company by asking to be allowed to sign the yearly agreement. If that were permitted, it would mean that, when hands are shortened, some of the regular men would have to go, which the Directors would much regret.

As in all money matters, such as Post Office and other savings banks, it is the rule to consider the names and accounts of the depositors private, the Directors undertake that, so far as they and the officers of the Company are concerned, the same rule shall apply. Similar books to those supplied by the Post Office Savings Bank will be given to each man who has an account with the Company.

This profit-sharing proposal cannot be withdrawn, and in no other way can the money or advantages so offered be obtained The Directors wish it to be worked for the benefit of the men; and they are willing to make all possible modifications of the details in order that it may work to their greatest advantage. Some objections have been made on the part of the stokers that show they have not clearly understood the proposal. The Directors and officers will be happy to give them any explanation whenever they wish it. This offer, which, if accepted in the spirit in which it is made, will be the beginning of a new relationship between employers and employed, and will work to their mutual advantage, will, in all probability, shortly include every man in the Company's employ that can possibly be brought in. It is offered in good faith, and with genuine good will. The Directors have done their part; and the responsibility and consequences of refusal must rest with the men themselves.

Nov. 18, 1889. GEORGE LIVESEY, Chairman.

Note.—Times of high prices are the worst for gas companies. Labour, coals, iron, bricks, pipes, and everything go up in price; but consumers burn very little more gas, and there are strong reasons for not raising the price—the only set-off being a small increase on coke.—G.L.

In the JOURNAL a fortnight ago (p. 932), we reported the result of the negotiations between the workmen employed by the South Shields Gas Company and the Board of Directors in regard to the demands of the former for shorter hours of labour and increased wages. It may be remembered that the men rejected the terms offered. The difficulty has now been arranged by the men accepting the following terms:—Firemen, 10 per cent. advance on present wages till Dec. 31, 1889; coke trimmers, 4d. per shift increase from Nov. 16; yard-men, 4d. per shift advance, with working hours from 6 a.m. to 5 p.m., and time-and-a-half for Sundays, Christmas Day, and Good Friday; sulphate men, 4d. per shift extra; lamplighters, 1s. 6d. per week advance, and to work three three-quarter days in the week during the summer season, from 9 a.m. till 5 p.m.; stokers and trimmers, after Dec. 31, 1889, to go back to the present rate of wages—stokers, 5s. 1½d. per shift; trimmers, 3s. 10d. per shift—time to be reduced to eight hours a shift, 19 retorts per shift; and time-and-a-half for Sundays, Christmas Day, and Good Friday. The demands made by the men in the employ of the Tynemouth Gas Company have been under the consideration of the Directors, and a favourable communication has been received by the men, conceding the following:—Eight-hour shifts, four charges per shift and 17 retorts per man; also time-and-a-half for Sundays, Christmas Day, and Good Friday. These concessions do not come into operation until the 1st of January, 1890, but in the meantime the men receive increased pay equal to 10 per cent. The men have accepted these terms. On Saturday, the 16th inst., the gas stokers employed by the Colne Local Board left their employment, and attended in a body at the Local Board offices, where the Gas Committee were holding a special meeting to consider the men's demand for an advance of 8d. per diem, to commence from the previous day. The men threatened that unless their demand was granted they would not return to work. A consultation took place, which resulted in the dispute being settled. The stokers are to be paid on the same basis, according to the amount of coal they lift, as the stokers at Nelson, the neighbouring town. They will not in future be required to weigh the coal, or wheel it into the retort-house; but they will each have charge of 12 retorts, instead of 10 as formerly. An allowance will be made for the fact that the retorts at Colne each hold ½ cwt. less than those at Nelson. The wages at Colne have been 26s. 10d. a week, and at Nelson, 30s. Last Friday, the stokers at the Nelson Local Board Gas-Works, on the expiration of their notice for a weekly advance of 5s.,

refused a compromise of 1s. 6d. It was ultimately arranged with the Manager (Mr. W. Foster), subject to confirmation by the Gas Committee, that the men should receive 32s. in future, and double pay for Christmas Day. This is an advance of 2s., and will be the future rate paid in Colne and Padiham. At a meeting of the Cleckheaton Local Board, last Monday week, the Gas Committee, who had considered a petition sent from the stokers, asking for an advance in their wages, recommended that an increase of 2s. per week per man be granted. The recommendation was adopted. At the meeting of the Coventry City Council on the same day, the Gas Committee reported that on the 29th of September the carbonizers, fitters, and yard-men at the gas-works applied for an increase of their wages and a reduction of hours of work. The Manager (Mr. G. Winstanley), after conferring with the Committee, had interviews with them, at which their first demands were moderated. If the increase now required were granted, it would amount to £1245 a year. As this question seriously affected the ratepayers, the Committee thought the Council might prefer to consider it at a public or private meeting, and act for themselves. If, however, they decided to leave the matter to the Committee, they would deal with it to the best of their judgment. The Chairman of the Committee (Mr. Andrews) stated that the original demand would have involved a yearly expenditure of £1850. It was decided to leave the matter in the hands of the Committee for settlement.

After everything had, as it was thought, been satisfactorily arranged between the Gas Committee of the Manchester Corporation and their workmen, a fresh difficulty has arisen by the men raising an objection to working with those who refused to join the Gas Workers' Union. The men sent in a petition asking, among other things, for the dismissal of the non-Unionists. This petition was considered at a special meeting of the Gas Committee on Monday last week, when the following resolution was passed:—"That every man who faithfully does his duty, and the work for which he is paid—so long as his services are required by the Gas Committee—shall have perfect freedom to continue his employment, and shall be protected in the discharge of his duties." Notices were sent in by a large number of the workmen in the carbonizing departments on Thursday; and at a full meeting of the Committee held the next day, it was resolved unanimously—"That this Committee do not see any reason to depart from their resolution of the 18th inst." The stokers at the gas-works in the neighbouring borough of Salford last Friday handed to the Gas Engineer and Manager (Mr. S. Y. Shoubridge) a fortnight's notice of their intention to leave their employment in consequence of the dispute which has arisen between the Manchester Gas Committee and the Union men. They do not express any dissatisfaction with the conditions under which they are working; all they say is that they are determined to support the Manchester men in the position they have taken up.

In addition to the revival of the trouble at Manchester and Salford, the labour agitation made considerable progress in other places in Lancashire during the past week. Demands have been made by the men employed at the Oldham, Ashton-under-Lyne, Stalybridge, Hyde, Dukinfield, Mossley, Rochdale, Bolton, and Radcliffe gas-works to share the advantages which have been gained by those in other towns. In an interview that a deputation representing the men had with the Oldham Gas Committee last Wednesday, there was a very long discussion. It was intimated that the stokers were quite willing to be put on the same basis as the men in Manchester. This they declined, as far as the men at the Bradford Road works of the Manchester Corporation were concerned, but were willing that the list "all over Manchester" should be taken and an average struck. In the end, the Committee offered certain concessions, and these were submitted to the Council of the Amalgamated Union, sitting at Manchester, the same evening. The Oldham men were satisfied with the terms; and, the Council having approved of them, work was continued without a break. Under the new arrangement, the stokers are to work eight-hour shifts, but carbonize the same quantity of coal as previously (3 tons 3 cwt.), have a fireman to look after the fires, have time-and-a-quarter for overtime, time-and-a-half for Sundays between 6 a.m. and 10 p.m., and double time for Christmas Day and Good Friday; stokers, firemen, and wheelers to be paid 5s. per day. The yard-men and labourers are to have an advance in their wages of 1s. 3d. per week of 50½ hours, as at present worked; the carters 1s. per week advance. It is in the stoking department that the financial arrangement will have the greatest effect. During the winter season there are, on an average, 220 men employed as stokers, firemen, and wheelers. Under the new system there will have to be 70 or 80 more men taken on. This will be an increase of wages to the amount of more than £100 per week. As a rule, very little work is at present done on Sunday. The labourers' or yard-men's wages will now be 22s. 3d. per week of 50½ hours; there being no change of time. About 140 men are employed in the yards at the various stations. At Ashton-under-Lyne an attempt has been made to induce the men to submit to conditions practically the same as those accepted by the Oldham *employés*. The negotiations have, however, not as yet been conducted to a satisfactory issue, and the men have given in their notices. If no arrangement is come to in the meantime, they will turn out on Thursday next. The Stalybridge Gas Committee had the men's demands under consideration at a special meeting last Thursday, and appointed a Sub-committee to negotiate with the men. At Mossley the men sent in their notices on Friday. The stokers want 5s. 6d. for 40 cwt., and an eight-hour shift; their present rate being 5s. for 42 cwt. in a twelve-hour shift. Mr. T. L. Sheppard, Manager of the Farnworth Gas-Works, has anticipated any action by the men. Foreseeing that they would in all probability join the agitation, he consulted with the Chairman of the Company (Mr. Warburton), and it was decided that the men should be allowed the same rate of wages as is being conceded elsewhere. The Rochdale Gas Committee, following in the wake of other similar bodies, have agreed to the men's conditions, and last Wednesday intimated that they would grant the demands made about a fortnight ago. Hitherto the men have worked twelve hours a day, and carbonized 48 cwt. of coal; their remuneration being at the rate of 5s. per day. Under the new arrangement they will only work eight hours daily, and deal with 42 cwt. of coal. They will be paid at the rate of 5s. for week days, and 7s. 6d. for Sundays. On Christmas Day and Good Friday they will receive 10s.; and those who work regularly all the year round are to have a week's holiday annually. This is a privilege they have not before enjoyed. The negotiations have been conducted in a very fair and amicable spirit. In Bolton the question is also practically settled. The matter was under consideration at a meeting of the Gas Committee last Friday, and the men's demands were conceded, with trifling exceptions. The stokers, who receive 35s. per week, including Sunday, applied for time-and-a-half for Sunday. This was granted; making the payment for Sunday labour 7s. 6d. instead of 5s. They also applied for double pay for Christmas and New Year's Days and Good Friday, and this was conceded as far as Christmas Day and Good Friday are concerned. To the permanent hands, three days' holiday will be allowed in the summer. The labourers' wages have been increased from 20s. to 22s. per week; with time-and-a-quarter for overtime. The only point in dispute between the men and the Committee is as to the payment for stoking over and above the 2 tons of coal and cannel per day. Hitherto they have stoked 2 tons 2 cwt. per day; but they apply for 1½d. per cwt. over the 2 tons. The Committee offer 1d. per cwt., and there the matter rests at present. The Radcliffe Gas Company have also come to terms with their men on a similar basis to that adopted at Bury (see *ante*, pp. 935, 978).

Among other places in which the gas workmen have joined the movement for improved conditions of labour may be mentioned Barnsley, Birkenhead, Keighley, Liverpool, Nottingham, and Rotherham.

The Plymouth Branch of the National Union of Gas Workers and General Labourers of Great Britain and Ireland held their weekly meeting on Saturday, the 16th inst., when the following resolution was unanimously adopted:—"That this meeting expresses its best thanks to the Deputy-Chairman, Secretary, and Engineer of the Plymouth and Stonehouse Gas Company for the fair manner in which they met the men's representatives in reference to their memorandum."

Extension of the Weardale Water Company's System.—The Weardale Water Company have accepted an offer of £4000 made by the Sanitary Authority of the Auckland Union towards the outlay in supplying a number of surrounding townships. The Authority are going to ask the Local Government Board to sanction the needful loan, repayable over a term of thirty years.

South Normanton Water Supply.—At a meeting of the Sutton-in-Ashfield Local Board held last Tuesday, it was decided to supply South Normanton with water at 10d. per 1000 gallons, with a minimum rent; the outlay for that parish being estimated at about £2000, and involving an additional expenditure of £600 to the Sutton Board. It was explained that the water would be supplied from a reservoir to be constructed near Hucknall Huthwaite, which would enable the Board to supply Blackwell and other districts when required.

Extensive Damage to Public Lamps at Cardiff.—There appears to be some disagreement at Cardiff as to whether the Gas Company or the Corporation are responsible for the repair of street-lamps which are damaged wilfully or accidentally. According to a letter from the Company, read at a meeting of the Corporation Lighting Committee last Tuesday, during the past twelve months no less than 5038 lamps had been damaged or destroyed. The lamps are the property of the Corporation; and the Company contend that when they undertook to light and maintain them, it was not intended that they should pay for wilful or accidental damage. The Committee decided that the Chairman should bring the matter before the next meeting of the Watch Committee.

Gas Explosion at Harrogate.—Early last Tuesday morning an alarming gas explosion took place at Harrogate, at the residence of Dr. Rennie, Eton House. On Monday night the family retired to rest, and the gas was turned out, but not turned off at the meter. In a side room a brass chandelier was suspended, and the taps of this, in common with the rest, were turned off, and everything was left apparently safe. The chandelier was of the usual kind, with a water slide; and it is thought that it was drawn down to its full extent, and was short of water. Early on the morning in question, the kitchenmaid proceeded to light the fire in the room. She entered with a lighted candle, and almost immediately a terrific explosion followed; the result being that the windows were blown out, and the door was forced off its hinges and demolished. The heavy window-curtains were set on fire; but the flames were quickly extinguished. Dr. Rennie went to the aid of the servant, who was found to be severely burned on the face and hands; but further than this she had suffered no injury, except shock to the system. The Gas Company's Engineer and Secretary (Mr. P. H. Wilkinson) was quickly on the spot, with the foreman, and at once found out the cause of the disaster.

Proposed Advance in the Price of Gas at Leeds.—The Gas Committee of the Leeds Corporation, at a meeting held last Thursday, resolved to recommend the Town Council, at their next meeting, to add 4d. per 1000 cubic feet to the price now charged for gas. At present the inhabitants pay 1s. 10d. per 1000 cubic feet, except those residing in the out-townships, who are charged 2s. 6d. The Committee base their recommendation on the results of recent advances in the cost of coal, and on the additional expenditure upon labour arising from the concessions just made to the *employés* at the gas-works. The coal used is estimated to cost £16,500 more during the ensuing twelve months than has been expended under this head within the past year; and the demands of the men will result in an outlay of £12,000 more per annum for wages. If gas continues to be consumed at the present rate, an advance of 4d. per 1000 cubic feet will yield about £31,000; so that, reckoning the increased cost of coal and labour at £28,000, there will be a yearly surplus of £3000 if the Council adopt the suggestion. The Committee estimate an increase of £11,000 in income from the higher value of coke and residuals, and therefore believe they will augment their total revenue to the extent of about £14,000. During the last few months the consumption of gas has increased 14 per cent.; hence the Committee hope, should this continue, to be in a still better position than the above figures indicate. On the other hand, the gas undertaking has been worked at a loss of about £5000 a year, and the aggregate deficit has now reached £30,000. Until this adverse balance has been cleared off, the Committee, it is stated, intend to devote to its reduction any surplus of income over expenditure.

The Price of Gas at Bradford.—In view of the recent advances in the price of coal and the concessions made to the stokers and other workmen employed at the gas-works of the Bradford Corporation, it has been supposed (says the *Bradford Observer*) that there would have to be some corresponding increase in the price of gas. An announcement has appeared that the Gas Committee of the Leeds Town Council contemplate raising the price either 4d. or 6d. per 1000 cubic feet. It is not expected that in Bradford any such extreme step as this will be necessary. It is estimated that the increase in the cost of coal for the year will amount to £9000 or £10,000; and that the concessions recently made to the workmen will involve increased payments of wages of above £5000. Supposing the consumption of gas to remain unaltered, an increase of 1d. per 1000 feet would yield about £5300; so that the possible deficiency in revenue would be met by an advance of 3d. per 1000 cubic feet. But the revenue derived from the sale of residual products shows some increase; improved methods which have been adopted are resulting in a larger yield; and there is a steady growth in the consumption, all of which will tend towards maintaining the revenue and the profits at their recent level. It is, therefore, the opinion of the Chairman of the Gas Committee (Alderman F. Priestman) that it will not be necessary to have recourse to the expedient of raising the price of gas; and this view, it is believed, is held by the members of the Committee generally. At the same time, it is as well to remember that, although the price in Bradford (2s. 3d., which with discounts, is practically 2s.) is a little higher at present than is charged in Leeds, the whole of the town is lighted "for nothing"—*i.e.*, out of the gas profits—at a cost of something like £20,000 per annum.

THE GASLIGHT AND COKE COMPANY'S COOKERY LECTURES AND GAS EXHIBITIONS.

In continuation of the cookery lectures already reported in the JOURNAL, The Gaslight and Coke Company have, for upwards of three months, been holding throughout the north of London exhibitions of gas cooking and heating stoves and of improved burners for lighting purposes, combined with lectures and practical demonstrations of cookery by two lady lecturers—Madame Alting-Mees and Mrs. R. Wilkinson—both holding first-class diplomas from South Kensington, and the latter formerly teacher of cookery there. For the purposes of these exhibitions and lectures, the following public halls were engaged:—Ladbroke Hall, Notting Hill; Kilburn Town Hall; West Hampstead Town Hall; Royal Park Hall, Camden Town; Driver and Perfect's Hall, Holloway; and the Assembly Rooms, Stoke Newington. Thousands of visitors, principally ladies, attended the lectures, which were delivered twice daily during the whole period; and on several occasions the halls were so crowded that visitors had to leave without gaining admission. The business done in letting and selling both cooking and heating stoves during the first six weeks was so satisfactory that the Company determined to continue them; and four of the halls were re-engaged, with even better results than at first. It is evident, from the success which has attended these demonstrations, that the more the Company show their consumers the advantages of gas cooking and heating, the larger will be that day consumption of gas which the Directors desire to promote; and it is further clear that the substitution of gas stoves and fires, at an average of more than 100 per week, for coal fires, which these lectures have been the means of effecting, must in time have some beneficial influence, even upon London smoke and fog. The Company's own show was confined to the gas appliances which they let on hire; but it was supplemented by considerable displays of stoves and fires of other kinds or sizes, by Messrs. H. and C. Davis and Co., Messrs. T. Fletcher and Co., Messrs. J. Wright and Co., and Messrs. W. Sugg and Co.; and, in addition, the last-named firm had a brilliant collection of their improved gas burners and lamps. A word of praise is due to the two lady lecturers for the excellence of their cooking, and the clearness with which they explained not only the preparation of the various dishes, from a rock cake to a complete dinner (everything being done in front of attentive and appreciative audiences), but also the proper—and, by way of warning, the improper way of using a gas-stove. These exhibitions and lectures were all under the management of Mr. T. I. Bird, the Company's Divisional Inspector, and were brought to a close, not because the field showed signs of exhaustion, but on account of prior engagements of the various halls. They will, no doubt, be resumed when opportunity offers.

THE HASTINGS TOWN COUNCIL AND ELECTRIC LIGHTING.

A Special Meeting of the Hastings Town Council was held on the 14th inst., to consider the question of electric lighting. The MAYOR (Mr. W. Stubbs) presided at the opening of the proceedings; but, being a shareholder in the Hastings and St. Leonards Gas Company, he vacated the chair during the discussion—his place being taken by the DEPUTY-MAYOR (Mr. Alderman Avers).

The Public Lighting Committee presented a report on electric lighting, in which they stated that they had considered the subject of a proposed application by the Corporation for a Provisional Order to authorize them to supply electricity for public lighting purposes, and recommended that the first area of supply be the whole length of the Front, from Rock-a-Nore to the end of West Marina, and that power be taken to extend the area to any part of the municipal borough subsequently by special resolution of the Council. In the event of the Order being obtained, it was proposed to construct a supply station at the destructor works at Rock-a-Nore, with two 70-horse power engines and two dynamos, and to erect 50 arc lamps of 12 ampères each for lighting the first area above mentioned. Estimates of the cost of the station and installation, and of the annual working expenses, which had been prepared by the Borough Surveyor (Mr. Palmer), and confirmed by an electrical engineer, and a statement of the present cost of lighting the area, were submitted with the report. The following was the estimate given of the cost of gas and electric lamps to be displaced by the proposed 50 arc lamps:—35 small gas-lamps, at £4 10s. 2d. each per annum, £157 16s.; 50 "Whitehall" lamps, at £11 9s. 4d. each per annum, £573 6s. 8d.; 15 electric lamps, at £30 each per annum, £450—total, £1181 2s. 8d. The cost of plant for the proposed installation was estimated as follows:—

Two engines, each of 70 indicated horse power, and laying on steam to do.	£800
Two dynamos, each capable of maintaining 50 arc lamps	800
Engine-house, testing-house, and foundations for engines, &c., shafting and pulleys.	800
50 arc lamps, pillars, &c., complete	1250
Main and branch cables, &c.	1200
Switches, cut-outs, &c.	150
Testing and measuring instruments.	150
Labour for laying mains and branches	400
	£5550
Add 5 per cent. for contingencies	278
Total	£5828

The estimate of the annual cost of working and maintaining the lamps was as follows:—

One electrician	£125
One engine-driver, at 32s. per week	83
Two men—one at 30s. and the other at 25s. per week	143
Fuel, say	250
Maintenance and depreciation of engines and dynamos	150
Maintenance of leads, lamps, &c.	200
Sundries	50
	£1001
Interest at 3½ per cent., and repayment of loan on £5828 in 30 years, say	299
	£1300

50 lamps, at £30 each, £1500.

The Committee further reported that they had had under consideration the communication from the Hastings and St. Leonards Electric Light Company, Limited, asking for the consent of the Council to the granting by the Board of Trade of a Provisional Order to the Company, authorizing the supply of electricity by them for public and private purposes in the borough, and they recommended that the necessary consent should be given, subject to such terms as it might be deemed expedient to impose, in view of the intended application of the Council for an Order.

Mr. JENNER moved the adoption of the report, and submitted a resolution authorizing the application for the Provisional Order. He said he thought the Corporation were doing the right thing in taking the electric lighting into their own hands. He believed the Surveyor had so very clearly set out the figures that he need say very little in introducing the matter. The cost, as they would see, would amount to £5828. He was at liberty to mention that the Surveyor had taken the opinion of a prominent gentleman in London, who had told the Surveyor that he had over-estimated rather than under-estimated the cost. In fact, he believed he went so far as to say that he would be very willing to undertake the work for the bare £5000—leaving out the £828; so he thought they would take the estimate as being well within the mark as to expenditure. The cost of working, reckoning the interest on and the repayment of the loan in 30 years, would be £1300. Then against this they had to deduct the cost of the gas and electric lamps which would be displaced under the new system, in which respect £1181 2s. 8d. would be taken off the present expenditure for lighting the borough. Consequently, the cost of lighting the whole of the sea-front from Rock-a-Nore to the end of the West Marina, and the cost of lighting that portion of it which at present was lighted, would be very small; the illuminating of the entire front under the proposed new arrangement entailing only an extra expense of about £118. They would see that they would get an improved light, and that at a very small increase in the cost, which he thought would be paid to great advantage. He was quite satisfied that, if they had the Order to enable them to carry out these works, it would be the right thing for them to do, and that the future would show the wisdom of their taking such a course at the present time.

Mr. BRYANT, in seconding the motion, remarked that a short time ago they had had an offer from the Electric Lighting Company to sell their plant; the price asked being about £14,000. The offer was not accepted. By the proposed system, they would have everything new. He took it that in the end they would be making a saving of between £2000 and £3000; and not only this, but would be giving the townspeople and visitors a splendid light. They must all acknowledge that the reason they had for so many years paid £500 per annum to the Electric Lighting Company for their light was not because it was cheaper, but on account of its brilliancy, and the enjoyment which their visitors seemed to derive from it. As the Council had not the slightest intention of supplying private consumers, he did not think they would be in any way hurting the Company.

Mr. PERKINS remarked that at present the electric light was put out at eleven o'clock at night, whereas when they supplied it themselves it would be allowed to remain burning all night, and would be observed from the sea. It would be a perpetual advertisement of the borough, and would, in his opinion, be one of the best investments ever made by the town. They would not only have a better, but, in the end, a cheaper light.

Mr. WESTON (a shareholder in the Gas Company) asked if there was not some serious misstatement in the estimates; and remarked that he should be very sorry to be a member of the Public Lighting Committee and present such figures.

Mr. JENNER said he had the authority of the Surveyor that he had submitted the figures to an authority in such matters, who stated that they were correct. Before the resolution was put, he desired to mention that the Committee were making provision for lighting that portion of the West Marina not lighted at present. The cost would not exceed what they would have to pay for lighting the whole sea-front with gas.

The resolution was then put, and carried *nem. con.* Two or three of the members, however, did not vote; some of them in consequence of their connection with the Gas Company.

A motion was then submitted to the effect that the consent of the Council should be given to the proposed application by the Electric Light Company; and it was carried.

THE INCREASE IN THE PRICE OF GAS AT BARNSLEY.

PROPOSED APPLICATION TO QUARTER SESSIONS.

At a Special Meeting of the Barnsley Town Council last Friday, the Mayor (Alderman Wood) said it would be remembered that, at the last meeting of the Council, a petition was presented by certain gas consumers, urging the Council to apply to the Court of Quarter Sessions for an order to examine the books of the Gas Company. That petition could not be considered unless it was treated as a matter of urgency. Mr. Wray moved, and Alderman Brady seconded, that the petition be considered on the ground of urgency. The motion having been agreed to, Mr. Wray proposed that the petition be carried forward. In doing so, he said it was signed by 500 of the largest gas consumers in the town; and he had authority by those who got up the requisition to say that it was readily signed. The petitioners felt if there was any remedy against the Gas Company, it could only be obtained at the hands of the Council. They were willing that the petition should be referred to the Park and Lighting Committee or the General Purposes Committee. Alderman Brady, in seconding the motion, said he should like to say a few words before the Town Clerk gave his opinion. He believed that the petitioners relied on clause 35 of the Gas-Works Clauses Act, 1847, which enacted that any two gas-rate payers might petition the Quarter Sessions to nominate and appoint an accountant, or some other competent person, not being a proprietor of any gas-works, to examine the accounts of a gas company, and such Quarter Sessions might appoint some such person, at the expense of the company, to ascertain the actual state and condition of the concern. They had to consider whether there were grounds within the four corners of that clause to ask the Court of Quarter Sessions to act. The question was, were there *primâ facie* grounds for them to take up the matter? What they had to decide was whether during the past year the profits of the undertakers had exceeded the prescribed rates. He thought they had a right to say to the Company: "We have allowed you to supply gas as a right. We have a right, as consumers, to demand it at the lowest possible price." He went on to argue that if from any circumstances the Company's expenditure increased, the consumers ought not to suffer, but the dividends should be reduced; and if the Company had been creating shares at a time when they could have raised money at 3 per cent., they ought not to look to the consumers to make up the difference by increasing the price of gas. They would be able to show this at the Quarter Sessions. The Town Clerk considered the consumers ought not to be called upon to pay more for gas. He was aware of what was going on elsewhere. He saw that in Leeds the Gas Committee had given notice of their intention to advance the price of gas from 1s. 10d. to 2s. 2d. per 1000 cubic feet, on account of the cost of coal and the extra wages demanded by their workmen. Mr. Woodcock then moved as an amendment, and Alderman Marsden seconded, that the memorial be referred to the Committee which had an interview with the Directors of the Company. This, on being put to the vote, was lost; and the memorial was then referred to the Park and Lighting Committee.

STOCKTON AND MIDDLESBOROUGH WATER BOARD.—The Stockton and Middlesborough Corporations and the South Stockton Local Board have approved of the Water Board applying in the ensuing session of Parliament, for large additional powers, involving an expenditure, it is computed, of something like £190,000.

BAHIA GAS COMPANY, LIMITED.

The Ordinary Half-Yearly Meeting of this Company was held last Thursday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. EDWARD HORNER in the chair.

The SECRETARY (Mr. A. J. Head) having read the notice convening the meeting, it was agreed to take as read the Directors' report and the statement of accounts for the half year ending June 30 last. A reference to these appeared in the JOURNAL last week (p. 978).

The CHAIRMAN said that, in proposing the reception of the report and accounts, he wished to make a few remarks concerning them. The latter, he was sorry to say, were not quite so good as they had been on previous occasions. Unfortunately, the Directors had had to contend against a great increase in the price of coal and also in freight. In addition to this, other things had not gone on at Bahia as they should have liked; and, in consequence, they had had to elect another gentlemen to take the management of the affairs out there. They had happily secured the services of Mr. G. Martin, who was formerly the successful Manager of the Nictheroy Gas Company's works until they were bought out. Mr. Martin was a good linguist; he was well acquainted with the customs of the people; and his average make of gas at Nictheroy was higher than they had ever accomplished at Bahia. In consequence of their misfortune, the business had been carried on at Bahia by the Sub-Manager, who, unfortunately for the Company, had not had any great experience there, and did not know the inhabitants. However, they were now improving; and, although the current half year would not be a very good one, he believed in the next six months they would be able to regain their former position. Of course, the increased price of coals and cost of freights (which together made the coals from 10s. to 12s. per ton dearer) was a serious matter, and one which it was impossible for the Directors to prevent; and this was the great blot on the future. Referring to the accounts, he said that the rental from public establishments was very fair. The general rental, however, was not so good as previously; but connected with it was the circumstance that the works had not been going on so well as they should have done. If they had a bad article for sale, they could not expect the consumers to buy it; and therefore they had a falling off in the consumption. One of the best things he had to mention was the fact that, instead of their investments being only on paper, they had been paid all the money that was due to the Company; and the Directors had invested it in first-rate securities. They had placed a few thousand pounds in Consols; so that they would always have, practically speaking, an amount of ready cash by them. Regarding the preliminary expenses in the accounts, of £2000, they had a sufficient amount of money to have got rid of it entirely. Thus this item need not figure in the accounts again. On the whole, he thought the concern was in a sound state. Of course, they could not avoid the increase in the price of other raw materials; but, he was confident, there would be a great improvement in the manufacture of the gas. He did not think it was necessary that he should go through the accounts, and point out the fluctuations in the various items; so he would conclude by moving—"That the report and statement of accounts now presented be hereby adopted."

Mr. HORATIO BROTHERS seconded the motion.

Mr. J. W. MASON remarked that he should have liked to have heard from the Chairman something more in regard to the faulty management which had taken place at Bahia. His statement was very shadowy indeed; and he thought it was due to the shareholders that some more specific information should be afforded. Perhaps the Chairman would like to do this at once, before he (Mr. Mason) continued his remarks.

The CHAIRMAN thought it better that Mr. Mason should proceed.

Mr. T. J. MAUDE and Mr. W. M. BICKERSTAFF both supported Mr. Mason's requests for further information.

The CHAIRMAN said that they were not very well satisfied with the management; and the working was bad. The make of gas per ton of coal carbonized at one time was 10,300 cubic feet, but last half year it had gone down to from 7000 to 8000 cubic feet; and the report they had on the condition of the works showed that the retorts and the plant were very disordered, and in a most unfortunate state.

Mr. MASON said he considered it was right that the shareholders should know why their Manager had resigned his appointment; and he daresay the Chairman had explained to the best of his knowledge the reason of the faulty management. He supposed they had not found any defalcations or anything wrong with the accounts of the late Engineer. [The CHAIRMAN: Nothing.] Looking through the accounts, it appeared to him that the defective management had not been recent, but continuous, having regard to the increasing decline of the revenue from public and private lighting. He had taken the trouble to go through the accounts for the past four years—from December, 1885, to the present statement—and he found that in December, 1885, the receipts were £18,944; while in the current half year, they were only £14,973—a difference of £4000. Now this appeared a very serious decline; and he could not help feeling that there must have been a continuous faulty condition of management somewhere to bring about this falling off in receipts. He presumed that Bahia was not a place that was decreasing in size; and they all knew how these South American cities spread. Bahia was a place of considerable extent; and he should have thought that, in common with other cities of a like character, the consumption of gas would have grown rather than diminished. They did not find that the expenses had been going down in a commensurate degree with the wane of the receipts; for in December four years ago, the expenditure for the manufacture of gas amounted to £15,114, and now it was £12,285—being a difference of about £2500. This year there was a large sum on the credit side of the account for exchange, which made the income swell very much. He was glad to hear the Chairman remark that they would soon lose the £2000 entered as preliminary expenses. It was two or three years ago that he (Mr. Mason) introduced this matter at one of their meetings, and expressed astonishment that, for the long period of time the Company had been in existence, £10,000 had stood upon the balance-sheet under this head. This sum was very soon eliminated to the extent of £8000; and he was pleased to learn they were going to do away with the £2000 that remained. Looking at the balance-sheet, he felt that it would not have been impossible to have paid a dividend of 10 per cent. They had above £9000 on the right side of the profit and loss account, and they would have a balance of £3900; so that the Directors could easily have recommended a 10 per cent. dividend. To test the feeling of the shareholders on the matter, he would, when the dividend was moved, propose an amendment. He hoped that the promises of the Directors in regard to the future management would be realized.

Mr. MEIKLE said he considered the shareholders should know how the Directors proposed to dispose of the preliminary expenses. About three years ago, the item stood at £10,000, but instead of writing it off profits, they added £8000 to the investment account—it had simply been transferred; and they were not in a better state. He also inquired whether or not the "bills receivable" (£17,784) had matured; and how long the contract with the Government had to run.

The SECRETARY stated that the bills referred to had matured.

Mr. HORATIO BROTHERS remarked that the contract had two-and-a-half years to run.

Mr. H. FINLAY, replying to Mr. Maude, said that their reserve was invested in Consols, Metropolitan Board of Works 3 and 3½ per cent. stock, Guinness's debentures, and Ottoman Railway first charge, in the following amounts respectively:—£2464, £3918, £3557, £3058.

Mr. MAUDE thought the £2000 of preliminary expenses should be written off the reserve fund. If it was added to the investment (which stood at £126,652), making it £128,000, it placed them in a fallacious position; but if they wrote it off reserve, they would know how they stood. With regard to the dividend, he could not agree with the gentleman who proposed that it should be increased to 10 per cent.; inasmuch as a great part of the balance of £3000 was really fortuitous profit. As he understood, it arose from the favourable state of exchange, which might not occur again. Therefore he considered it would not be wise to divide the balance at once; but it should be saved for equalizing the dividends on future occasions.

Mr. FINLAY, in answer to Mr. Machell, stated that Mr. Martin left England for Bahia, on the 24th of last month.

The CHAIRMAN, referring to the reduction in the sales of gas, said that one matter which operated against them very materially was that the authorities at Bahia could not afford to pay for the public lamps; and failing to carry out their agreement, it was necessary to reduce the number of the public lamps by 400, which represented an annual reduction of their receipts by £3600.

Mr. HORATIO BROTHERS said the Accountant reminded him that the preliminary expenses were originally £17,000, £7000 of which were written off profits. After this the Board asked the Accountant to go through the accounts, and ascertain how much of the balance should be added to capital; and he decided that £8000 would be the proper amount. The £2000 had been left over; and it was a question in his mind whether the preliminary expenses were not all part and parcel of the capital and ought not to be placed to the account.

Mr. FINLAY said he could not see how the proprietors would be injured by leaving the item as it was. As to the resignation of the Manager, he stated that the Board had not hastily accepted it, but had given the matter a careful and long consideration.

After some further discussion, the motion was unanimously carried.

On the proposal of the CHAIRMAN, seconded by Mr. J. DARELL BLOUNT, dividends were declared at the rate of 10 per cent. per annum on the preference capital, and 7½ per cent. on the 7½ per cent. preference capital (both less income-tax), and 8 per cent. on the ordinary capital (free of income-tax).

Mr. MASON observed that he was satisfied with the statement of the Chairman that the balance of profits was retained for the purpose of maintaining the dividend at the normal rate.

The CHAIRMAN next referred in feeling terms to the loss the Company had sustained by the death of Mr. Arthur Clarke, and mentioned that they had elected Mr. Blount to the vacant position on the Board. He moved a resolution confirming the appointment.

Mr. HORATIO BROTHERS seconded the motion, which was agreed to.

On the proposition of the CHAIRMAN, seconded by Mr. FINLAY, Mr. Brothers, who retired by rotation from the Board, was re-elected.

Mr. GUYATT proposed, and Mr. MACHELL seconded, the re-appointment of the retiring Auditor (Mr. J. Wright).

The several gentlemen who had been re-elected acknowledged the confidence that the shareholders placed in them; and after the usual complimentary vote had been accorded to the Chairman and Directors, the proceedings terminated.

LOTHAMMER GAS COMPANY, LIMITED.

An Adjourned Extraordinary General Meeting of this Company was held on Monday last week, at the Offices, No. 6, Lombard Court, E.C.—Colonel H. Y. MURRAY in the chair—to receive a report of the Committee of Investigation appointed at a previous meeting (*ante*, p. 936).

Mr. PARKER RHODES read a long report of the Committee, which stated that an examination of the books and the share register revealed the fact that the Board had been composed of Mr. Lothammer and four other gentlemen, three of whom did not hold a single share in the Company, while the fourth held only one share actually subscribed for. A grave question arose with regard to the validity of the acts and proceedings of a Board thus constituted. With regard to the alleged contract with Mr. Bower, the Committee found that at a Directors' meeting held on the 2nd of September it was resolved that a cheque for £250 should be handed over to Mr. Bower "in general account for goods supplied and to be supplied;" and, as a matter of fact, this sum had been paid to Mr. Bower. The Committee had called in Mr. W. S. Ogle to advise them; and his report showed that this payment comprised an over-payment of £212, which sum Mr. Bower accordingly owed to the Company. The Committee went on to state that it was obvious that, with a continuation of its present management, the Company must in a few weeks more have inevitably drifted into liquidation; and they expressed the opinion that the Directors ought not to have gone to allotment under the circumstances. The allotment was made on applications totalling £5448 only, out of which £2000 was payable to the vendor and various expenses had to be met. The total amount of share capital paid up by subscribing shareholders was only about one-ninth of the share capital allotted. Although the ostensible consideration for the purchase of the patents was £2000 in cash and £38,000 in paid-up shares, Mr. Lothammer only bargained with the promoters for one-third of this amount, and had actually received £1500 in cash and £11,663 in shares; the balance being intercepted by a group of promoters and others. The report further stated that the Committee did not meet with any evidence or information tending to disparage or diminish their confidence in the value of Mr. Lothammer's system, and they believed in its success. It was clear, however, that a further amount of capital would be necessary unless the Company was fortunate enough to sell one of its foreign patents, for which negotiations had been set on foot. Mr. Lothammer had practically evinced his good faith, and his sympathy with the shareholders, by voluntarily offering to reduce the shares held by him, if by so doing the allottees of the promoters' shares were induced to make an adequate surrender, so as to reduce the total share capital within fair and reasonable limits. If such a reduction could be brought about, the Committee believed in the successful future of the Company. The Committee recommended that a provisional Executive be appointed; it being, in their view, clear that the present *de facto* administration could not remain in office.

A long discussion then took place on the questions as to whether Directors who did not hold shares could sit on the Board; and as to whether it was competent for the shareholders to appoint new Directors at that meeting.

Mr. PARKER RHODES ultimately moved that a provisional Executive

be appointed to carry on the business of the Company until a new Board could be appointed.

Mr. CANTWELL seconded the motion.

Considerable discussion followed; and eventually the CHAIRMAN, on being appealed to, said the present Board were perfectly ready to resign the management into the hands of competent men.

Ultimately the Committee of Investigation were appointed the Executive for a month.

The proceedings afterwards terminated.

HUDDERSFIELD CORPORATION GAS AND WATER SUPPLY.

At the first meeting of the Huddersfield County Borough Council after the recent elections, there was presented the usual Mayoral statement dealing with the principal events during the past municipal year. Concerning the Gas Department, it was stated that the amount of cannel and coal used in the year was 42,585 tons, in comparison with 41,638 tons in the previous year—an increase of 947 tons. The amount of gas distributed was 463,834,000 cubic feet, as against 447,900,000 cubic feet last year—showing an increase of 15,934,000 cubic feet. The average illuminating power of the gas was 20·40 candles, against 20·10 candles in the preceding year. A new building was erected; and a Feldmann apparatus put up in it for the manufacture of sulphate of ammonia. These works were now in active operation; and appeared at present to be doing the work satisfactorily. About 350 new consumers were added during the year. The whole of the works and mains had been kept in a state of thorough repair and efficiency. The figures embodied in the statement relating to the water undertaking show that the work of the department is still substantially increasing. The various reservoirs and line of conduits, it was stated, had been maintained in good working order and condition. The quantity of water in store at Blackmoorfoot was 600 million gallons, as compared with 540 million gallons in the previous year. The renewal of mains during the twelve months was 648 yards, as against 378 yards last year. The mains were extended by 8750 yards, as compared with 8499 yards. The water supplied for trade purposes inside the borough was 368,799,000 gallons; and outside, 70,930,000 gallons—being a total of 439,727,000 gallons, as compared with 427,707,000 gallons. The population supplied inside the borough was 98,105; outside, 35,740—being a total of 133,935, as against 132,415 at the same time last year. The number of houses added during the year, inside the borough was 346; and outside, 257—or a total of 603, as compared with 488 last year. The number of meters fixed inside the borough was 410; and outside, 125—being a total of 535, as against 521. The length of mains laid was as follows:—Branch mains, 30 miles 446 yards; distribution mains, outside the borough 119 miles and 43 yards, inside 69 miles and 689 yards—total, 218 miles and 1178 yards, as compared with 213 miles 1228 yards in the preceding year. Further extensions of the works it was said were contemplated, and would be the subject of an application to Parliament in the ensuing session.

THE PROBABLE DURATION OF THE ENGLISH COAL SUPPLY.

At the Opening Meeting for the present Session of the Manchester Geological Society, the PRESIDENT (Mr. H. Hall, one of Her Majesty's Inspectors of Mines) took as the subject of his Inaugural Address the probable duration of the English coal supply. The principal portion of the address was as follows:—It is now 20 years since the Royal Commission reported on the probable duration of the coal supply of the British Islands; and I think it will be interesting to see how far the estimate then made has been verified. The Commission was thought desirable at that time, to allay or justify some excitement caused by opinions expressed by Professor Jevons to the effect that the coal supply of the United Kingdom was being rapidly exhausted. I believe he made out that we should be reduced to sore straits for coal at the end of 100 years. The report, which was made on July 27, 1871, after some five years' labour, was a most able and complete one, and embraced the result of searching inquiries into every phase of the subject; and no one who looks through the report can fail to be struck by the amount of industry it displays. The inquiry naturally divided itself into several branches; but the two great questions to be solved were: (1) The quantity of coal available in these islands—that is, coal which might fairly be considered to be within the reach of mining appliances; (2) the rate and progress of consumption—this latter being much the most intricate and difficult of solution. In order to arrive at anything like a correct estimate of the quantity of coal available, the extent of known coal-fields had to be ascertained, the probability of fresh fields being discovered to be considered, and the depth to which workings could be carried to be decided.

The Commissioners proceeded by means of Committees to sift these questions. The extent of the known coal-fields it was possible to ascertain with some degree of certainty; and the report gives this quantity at 90,207 millions of tons at depths not exceeding 4000 feet, and exclusive of the coal overlaid by the Permian new red sandstone, &c. Of this quantity Lancashire and Cheshire are said to contain 5546 millions of tons; North Wales and Anglesey, 2010 millions. In giving this estimate, it is not definitely stated what deductions were made for probable loss in working. As a deduction of 40 per cent. is made in another part of the report, we may assume that it was made in this case; and I believe in valuing a coal-field it is usual to take about two-thirds of the measured tons into account, so that the deduction is apparently a fair one.

The Commissioners have estimated the coal at less depths than 4000 feet underlying the Permian formation at 56,273 millions of tons; making an aggregate total of 146,480 millions. These latter are the figures they rely upon in calculating the actual coal supply of the United Kingdom. At the same time they hint at the possibility of our working at much greater depths—even to 6000 feet, at which depth the natural temperature would be upwards of 150° Fahr.; and they estimated the coal between 4000 feet and 6000 feet at 29,000 millions of tons. The question of coal being found under the cretaceous rocks in the South of England, and extending to the Bath and Bristol coal-fields, was also considered. The opinions of many eminent geologists were sought on the subject; but their views varied to such an extent that it was felt to be advisable to pass over this question. In fixing the depth of available coal at 4000 feet, giving a natural temperature of 114° Fahr., there seems to have been a good deal of speculation and difficulty in deciding whether or not a mine at such a depth could be sufficiently cooled down by ventilation to allow of work being carried on with any degree of success. However, the Commissioners eventually decided in the affirmative. Having fixed the depth to which workings might be carried, and the coal available down to that depth, they proceeded to seek a divisor by which to calculate the exhaustion of our coal-fields.

Apparently, on the advice of Mr. Price Williams, it is sought to show that the consumption of coal in future years will bear a fixed relation to the increase of population; and many pages of the report are devoted to elaborate calculations as to what that increase is likely to be. The decision arrived at seems to be founded on the theory that the consumption of coal will be rather more than 4½ tons per head of the population per annum, exclusive of coal exported; and on this consumption it is shown that 146,736 millions of tons—that is, the quantity the Commissioners estimated as available—would be entirely exhausted in 360 years. A second method of calculation is by simply adding a constant quantity—viz., 3 million tons, which is co-equal with the average annual increase of production during the previous 14 years—to each following year's production. The Commissioners state that at the end of 100 years from 1871 the annual consumption would be 415 million tons; and from these data the coal would be exhausted in 276 years. A third calculation is made on the assumption that the then population and consumption would remain constant—simply oscillating without advancing; and in that case the coal would last over 1200 years. This view, however, was not considered of any importance; and it has certainly been amply disproved. Of course, as the Commissioners pointed out, there are many other contingencies to be taken into account; the most important being the increasing cost and difficulty of working as the coal-fields draw near to a close. This, they say, will prolong their life to some extent, by diminishing production.

I now propose to show to what extent the conclusions of the Commissioners have been verified up to the present time. The calculation based upon population, and giving the duration of our coal at 360 years, is somewhat difficult to follow. The report estimated that the population of Great Britain in 1881 would be 28,943,000, whereas the census for that year made it 29,710,012; and they fixed the home consumption of coal per head of the population per annum at 4·4266 tons, whereas it proved to be 4·7857 tons. Since 1881 we have no means of knowing to what extent the population has increased; but the Commissioners estimated that in 1891 the population of Great Britain would be 31,955,000, and that the home consumption of coal per head per annum would be 4·5786 tons. Now, if we divide this estimated population for the year 1891 into the production of coal for 1888, which is 170 million, less the difference between the Commissioners' estimate of export (12 million tons) and the actual export (20 million tons), giving, say, 162 million—we have a consumption of 5·007 tons per head of the population, against the 4·5786 tons estimated by the Commissioners, or a difference of nearly half a head. That is, the consumption is estimated at nearly 10 per cent. less for the year 1891 than it was found to be in the year 1888. This being so, apparently we may deduct at least 10 per cent. from the 360 years fixed upon by the Commissioners, which simply corrects the error at the end of 20 years, without taking into consideration the under-estimate over the whole period, which would be very considerable.

We have now to test the second system of calculation, which I think the most important, from which the duration was fixed at 276 years, and which was arrived at by adding a constant quantity of 3 million tons to each year's production or consumption since 1869, in which year the coal raised amounted to 107 million tons. On this basis the production of 1888 works out to 164 million tons; and the actual statistics for 1888 show it to be 170 millions.

I think the Commissioners may fairly be congratulated on this extraordinarily close estimate, made nearly 20 years ago; the difference being only a little more than 3 per cent. The lapse of time and events have in this way certainly presented very strong evidence in favour of this latter method of calculation. I find that if the average increase of the last ten years only is taken—that is, from 1878 to 1888—instead of the 14 years previous to 1869, the amount to be added would be about 4 million tons per annum. On this basis the contents of the coal-fields—viz., 146,736 million tons—would be exhausted in 230 years from 1888. Thus, both systems seem to considerably over-estimate the duration of the coal supply.

I have pointed out that the Commissioners based their report on the assumption that seams of coal could be practically worked down to depths of 4000 feet, where the natural temperature would be about 116° Fahr. This temperature calculated upon 1° for every 60 feet of depth, I have found by experiment to be under the mark, and requires the addition of 1° for every 100 yards of depth; so that at 4000 feet the temperature would actually be nearly 130° Fahr. I find that the natural temperature can be considerably reduced by means of ventilation. The Commissioners fixed the amount of this reduction at 7° when the air had to travel round a long wall-face; but, from experiments made when large volumes of air are passing, the natural temperature at the face is sometimes reduced as much as 15°. This still leaves us with a temperature of 115° at 4000 feet depth. Now, I find that workmen begin to complain of heat when the temperature reaches about 80°, and I think that there is little hope of English workmen being able to do a fair day's work when the heat exceeds 90°. Personally, I find it distressingly hot in workings at 80°. From this I think we may conclude that, with our present knowledge and appliances (which, however, must by no means be considered finite), when temperature due to depth reaches 100°, coal cannot be worked except at very great expense, if at all.

Now as to the probability of the large amount of 56,273 million tons of coal being won from under the Permian and other formations. Mr. Dickinson [another Inspector] whom I have consulted as to the extent to which this hope had been realized up to this time states: "I am not aware that to any extent since the date of the report any new light has been thrown on this subject. There are, as you say, instances under the dip of the overlying formations where they thicken rapidly. But there are other instances where they thicken slowly; and these instances so far as I have had opportunities of judging, balance each other on the average, and are like many coal basins which have a very slight dip at one side but are steep at the other. My own opinion is that the new red sandstone thickens rapidly from its edge. At Banfurlong Colliery, near Wigan, the sandstone is 26 yards thick at the main pit; and in a bore-hole being put down 1½ miles distant, it has already been proved 275 yards in thickness, and the hole is still in sandstone. At Prescot some bore-holes were put down, and the red rock was found to increase from 105 to 155 yards in a distance of 300 yards. In addition to the difficulty of depth in sinking there is also the question of water, which is always found in very considerable quantities in passing through red sandstone." On these grounds I consider that we may fairly discard the idea of any large amount of coal being available from this source. With regard to the probability of coal under the Cretacean rocks in the South of England, it seems hardly possible to conceive that the commercial enterprise of Englishmen could have failed to discover it long ago if it had been in existence. This being so, I fix the available coal at 90,207 million tons; that is, the quantity estimated at less depths than 4000 feet, allowing any additional quantity that may be obtained from under the red rock to stand as a set-off against that which may be found impracticable on approaching 4000 feet; and on this datum, if we add 3 million tons to each future year's production—this being the average increase since 1854 up to 1883—we get a life of 192 years. But the increase over the ten years previous to 1869 is 4 million tons; and assuming the future increase to be equal to this, we get a duration of 171 years only from the present time.

METROPOLIS WATER SUPPLY.

The returns furnished to the Registrar-General by the London Water Companies on the water supply of the Metropolis during the past month, show that the average daily supply was 170,403,008 gallons, being at the rate of 28·9 gallons per head of the population, as compared with 27·9 gallons per head in the corresponding month of last year. Of the entire bulk of water sent out, 85,267,475 gallons were drawn from the Thames, and 85,135,533 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was—Kent, 1·1; Colne Valley, 1·6; Tottenham, 1·7; East London, 1·9; New River, 2·1; Chelsea, 2·6; West Middlesex, 3·0; Lambeth, 3·1; Grand Junction, 3·2; and Southwark, 3·7. The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was considerably inferior in quality to that delivered in September, owing, doubtless, to the access of decaying vegetation to the river. All the water was efficiently filtered. The water abstracted chiefly from the River Lea by the New River and East London Companies was also efficiently filtered. That delivered by the East London Company was equal in quality to the September supply; but the New River Company's water was much inferior. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health were, as usual, of a high degree of organic purity; the Kent supply being especially distinguished in this respect. All these waters were clear and bright."

Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner for the Metropolis (General A. de Courcy Scott), on the quality of the daily samples of the water supplied in London last month, say:—"Throughout the month of October the supply of water to the Metropolis continued to be of excellent and very uniform character; the proportion of organic carbon in any single sample of Thames-derived water examined varying only from 0·135 to 0·155 part in 100,000 parts of the water; with a mean of 0·143 part, as against a mean of 0·138 part in the previous month's supply—the absolute difference of 0·005 part in 100,000 parts of the water being wholly insignificant. In respect also to its clearness, its degree of freedom from colour-tint, and its minute proportion of matter oxidizable by permanganate, the October water supply well sustained the satisfactory character presented by the supply of the previous month."

THE CHARGES AGAINST THE CHELTENHAM CORPORATION WATER ENGINEER.

In the JOURNAL for the 29th ult., we reported the proceedings at a special meeting of the Cheltenham Town Council, held on the previous Friday, at which a Committee presented a report on the result of their investigation of certain charges which had been brought against the Water Engineer of the Corporation (Mr. W. M'Landsborough). These charges were: (1) That he had obtained the appointment of his son to the clerkship of works at the Tewkesbury Water-Works, and withheld or suppressed the application of a Mr. Davis for the appointment; (2) that he had improperly withheld a letter of complaint against his department, addressed to the "Municipal Commissioners of Cheltenham," and admittedly intended for the Town Council. Although Mr. M'Landsborough offered explanations on both charges, the Committee considered them to be unsatisfactory; and they recommended the Council to call upon him to resign. This was done; and the Town Clerk subsequently officially apprised Mr. M'Landsborough of the fact. This gentleman has replied to the charges in a long letter to the Town Clerk, in the course of which he explains, with regard to the appointment of his son, that it was made by the Council themselves on the 3rd of June last, practically on the facts stated in the report of the Committee. He says the appointment was in itself a good and proper one, as the results prove, and the works conclusively show; and the suggestion that Mr. Davis was prevented from obtaining an appointment from the time of his letter dated the 26th of February last until the 6th of May, as stated in the report, is conclusively disproved, because he was appointed clerk of the works by the Coventry Board of Guardians on the 6th of March, just two months previously. As to the second charge, he states that he himself received the letter in question, and at once gave the writer personally a full explanation of the regulations and practice of the Corporation with regard to house-service fittings, on which the difficulty had arisen; whereupon the fittings were amended, and the water supplied to the complainant on the following day. The matter being thus personally attended to and disposed of, the letter was not one, in the Engineer's opinion, that required to be brought before the Water Committee. But he says it was not intentionally withheld from them, nor was there any motive to prompt him to withhold it. The letter made no complaint against himself. The writer merely complained at being called upon to provide the fittings prescribed by the Corporation in place of the old wasteful fittings. He was obliged to insist upon the practice of the Corporation; and this being conceded, he considered there was an end of the matter. He then deals with certain allegations of "friction" between the Water Department and the public, and with his general conduct of the works, both of which matters had to be investigated by the Committee; and he says that if they had made a thorough inquiry, they would have discovered that since the management came into his hands (25 years ago) the income derived from the works had been nearly doubled; while by the prevention of waste, the expenditure of water had been simultaneously reduced to an extent by which the capital value of the undertaking, calculated upon the usual basis, had been increased by about £120,000. Also that, notwithstanding the large outlay of nearly £90,000 in connection with the new works, the department would have been a source of profit to the present ratepayers had it not been for the conversion of income into capital by the sinking fund provided to redeem the works for the benefit of the future inhabitants. Mr. M'Landsborough claims this as a great practical and financial success. He thinks that if he has committed faults, they have been entirely due to errors of judgment in trivial matters, and not such as to justify his being called upon to resign his office. He asks the Corporation to apply to the Local Government Board to instruct one of their Inspectors to visit Cheltenham and make a public inquiry into the management of the water-works. He says he should regret a precipitate severance of his connection with the undertaking of which he has so long been Manager. But it is of still greater moment to vindicate his professional character from imputations which he cannot help thinking arise rather from personal hostility or party influences than from a due consideration for the public service. Were he to resign his office, he would, he says, appear to give some colour to these imputations; and he therefore declines to do so, and urges the public inquiry he suggests. He says he has no desire whatever to retain his position a moment after his character is no longer impugned, and unless he can do so at the wish of the Corporation, and with the full confidence to which he has so long been accustomed.

THE ASSESSMENT OF THE MERTHYR LOCAL BOARD WATER-WORKS.

In the JOURNAL for the 1st ult., there appeared a brief report of the first day's proceedings in an appeal before the Merthyr Union Assessment Committee by the Merthyr Local Board for a reduction of the assessment of their water-works. The consideration of the question was adjourned to permit of an application being made to the Board of Guardians for leave to call in the services of a valuer for the water-works of the Union. The hearing of the appeal was resumed last Saturday week, when the Clerk to the Local Board (Mr. Gwllym James) dealt with a report which had been prepared for the Committee by the valuer who was appointed. This gentleman (Mr. Fenwick) advised the Committee that the water-rents received by the Board did not represent the value of the water supplied to the district, and did not therefore form a proper basis for estimating the rateable value of the undertaking; inasmuch as the Board could make up any deficiency out of the rate to be levied in aid, or by contributions out of the general district rate. Mr. Fenwick could not accept the valuation of the gross revenue (£5775) made by Mr. J. Thomas, the City Surveyor of Bristol, on behalf of the Board; and stated that, in consequence of the way in which the Board's accounts had been kept, there had been a transfer from the general district rate to the water account, and this must be taken into account. Mr. Fenwick placed the gross income at £8424, and the rateable value at £3031. Mr. James proceeded to point out that, although in his report Mr. Fenwick declared the deficiency could be made up by a rate in aid or contribution out of a general district rate, no section of the Act of Parliament had been referred to by Mr. Fenwick; and he asked what case he had to meet. Mr. F. T. James, the Clerk to the Assessment Committee, pointed out that sections 61, 62, 63, 64, and 71 of the Merthyr Water Act gave the Board power to levy rates. Mr. G. James then reviewed the provisions of the several sections, and argued that the powers of borrowing under the Special Act were inserted for the protection of the lenders of money, and had no application to levying a special rate. The representatives of the Board having retired, the Committee shortly discussed the matter. The Chairman said he thought it would be better to grant the Board a case. The point to be decided, remarked the Clerk, was whether or not the amount the Board drew from the general district rate to supplement the water-rents was assessable. Mr, James was called in, and it was decided that a case should be stated, with the consent of the Board, for the opinion of the Queen's Bench Division.

RAWMARSH LOCAL BOARD GAS-WORKS.—The new gas-works at Rawmarsh are now being proceeded with, and Messrs. R. and J. Dempster, of Newton Heath, Manchester, have received instructions from the Local Board to commence forthwith, the manufacture of part of the plant, consisting of a gasholder 80 feet in diameter and 20 feet deep, together with retort-house and coal-store roofs and an overhead tar and liquor tank. The work is being carried out under the direction of Mr. T. Newbigging, C.E., of Manchester, who prepared the plans.

THE TUNSTALL LOCAL BOARD AND ELECTRIC LIGHTING.—The Municipal Electric Light and Power Corporation, Limited, and the Electric Trust, Limited, having signified their intention of applying for a Provisional Order to supply the electric light in Tunstall, the Local Board, at their last meeting, passed the following short but comprehensive resolution:—"That consent be not given to either application, unless such terms are inserted in the Provisional Orders with reference to the purchase of the undertakings and as to other matters which the Board should be advised to be in the interests of the ratepayers; that the Clerk be instructed to oppose unless the foregoing be agreed to; and that the Companies be asked to pay all expenses."

BARNSLEY TOWN COUNCIL AND ELECTRIC LIGHTING.—At a special meeting of the Barnsley Town Council last Friday, Mr. Wray moved the adoption of a recommendation of the Park and Lighting Committee that the Council should apply for a Provisional Order to supply electric light. In doing so, he said the action of the Gas Company had been most oppressive. The defiant manner in which they had met the burgesses in regard to the price of gas, he thought, demanded that the Corporation should take some action as the ruling body of the town, in order, if possible, to put an end to the monopoly under which they laboured. Alderman Brady seconded the motion, and it was agreed to.

THE SUPPLY OF GAS COMPANIES' ACCOUNTS.—At the Westminster Police Court last Saturday, Mr. Marsden, a resident of Paddington, applied to Mr. Sheil for a summons against The Gaslight and Coke Company for refusing to supply him with a copy of their annual accounts. The applicant said the Assistant-Secretary contended that the provisions of the Gas-Works Clauses Act, 1847, in regard to the supply of accounts, did not apply to his Company; but he (Mr. Marsden) had no doubt it did, and was willing to take all responsibility in connection with a summons. The penalty was fixed at 40s. a day. Applicant tendered a fee of 1s., as required by law. Mr. Sheil granted a summons; but at the same time informed the applicant that if he failed to make good his case he would have to pay the costs.

THE BARNET LOCAL BOARD AND THEIR ELECTRIC LIGHTING CONTRACTOR.—Quite at the end of the meeting of the Barnet Local Board last Tuesday, Mr. James referred once more to the perennial topic of the defective electric lighting of the district, and asked whether or not the Board were going to take any steps in the matter. Some members protested that the business was over; but the Chairman (Mr. C. Stevens) ruled otherwise; and the subject was discussed. Mr. James characterized the whole lighting as a perfect farce, and a laughingstock for all who came into the district. The contractor had, he said, forfeited all claim to consideration from the Board, having violated his engagements again and again; and he (Mr. James) therefore moved that Mr. Joel receive notice to terminate his contract unless within 14 days an improvement was made in the light. Mr. Baughen seconded the motion. Mr. Parsloe said he thought it would be well to prick up Mr. Joel a little until the expiration of his contract, and then take up the lighting—whether electric or gas—themselves. An amendment was submitted by Mr. Schmidt, giving the contractor 28 days' grace. But, after several modifications, it was not carried; and Mr. James's proposition was agreed to. The *Barnet Press*, commenting on this matter last Saturday, said: "The Barnet Local Board has at last awakened to a fact which has been patent to the general body of ratepayers for the last 13 months—viz., that the contractor for electric lighting has miserably failed to redeem his lavish and oft-repeated promises, and has not fulfilled his contract to the satisfaction of even the least exacting; and that the only way out of the unfortunate business is to enforce the contract in such a manner that the contractor must either fulfil his engagement or take his departure." As to the proposal that the Board (failing a contractor) should take over "the works," the paper above mentioned does not think it needs to be seriously discussed at present. "If," it says, "an undoubted expert like Mr. Joel cannot succeed, the ratepayers are not likely to give the Board a blank cheque for any such expensive experiment."

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

One of those popular fallacies which occasionally take possession of the public mind came to the surface at a meeting of the Edinburgh Town Council on Tuesday, when Treasurer Clapperton stated that he had had a great many complaints about the quality and the pressure of the gas. Mr. Clapperton was a Director of the Edinburgh Gas Company, and is now a member of the Gas Commission, and it might have been expected that he would be able to explain to the complainants that there was no falling off in either respect, instead of which he gave mouth to their grumblings. As a matter of fact, the Analysts' report, which was the text upon which he spoke, showed that the quality of the Edinburgh gas on Oct. 22 was 29·40 candles, and on Nov. 14, 32·40 candles; while that of the Leith gas on the same dates was 32·60 and 28·30 candles respectively. The Engineers are instructed to make gas of not less than 26-candle power; and the above figures show that they were considerably over the minimum. The Lord Provost said he had also heard a great many complaints, and intended to bring the matter before the Gas Commission. Now, in all gas-lighted localities, there will always be instances occurring in which the light is not so good as it once was; but as all JOURNAL readers know, the cause will be found to be local. Gas commissioners or directors ought to know this; and why these gentlemen should have aired in public the views they did, I cannot understand, except on the assumption that they have not paid much attention to their business, and did not know what they were talking about. Neither the Lord Provost nor the Treasurer acted an honourable part in stating these complaints in public, in the absence of the gentlemen who are responsible for the quality and the pressure of the gas, and without having, along with the complaint, the means at hand of giving explanations which would allay the fallacy. What makes the matter worse is that both gentlemen are members of the Gas Commission, and are therefore themselves to blame if there is anything wrong.

The litigation by Messrs. Mackay and Co., mentioned in my "Notes" last week, has taken a new and unexpected turn, and one which will facilitate a solution of the difficulty. The Directors of the Edinburgh Gas Company appear to have grown tired of the matter, for on Tuesday it was intimated to the Judges of the Second Division of the Court of Session that they had given in and paid a sum to Messrs. Mackay and Co., to get out of the action. The pursuers have not made much out of the Company. The amount paid was £350; and no expenses were found due to or by either party. Following upon this settlement of the action against the Company was the statement on behalf of the pursuers that they now restrict their claim against the Commissioners to the period since the transfer —Aug. 1, 1888—and the sum concluded for to £2000. On the ground being thus cleared, their Lordships sent the case against the Commissioners back to Lord Wellwood to be tried by a jury. No other claim has emerged against the Edinburgh Company, and now that it has settled this one, nothing remains but to distribute the balance of the funds among the Directors, and then to dissolve the Company. The Directors, knowing that this claim might be enforced, retained a sum of over £5000 to meet it; so that they have sufficient funds on hand, and the balance is part of their fee, or bonus, or whatever other name it may go by. It was pleaded at the bar as a hardship of the case, that the shareholders had already had their bonus, and that any sum Messrs. Mackay might receive, would come out of the pockets of the Directors. However, they will not be so badly off. There were, I think, eight of them; and, according to the above figures, they will receive about £600 each. I have heard it stated that the Company made very liberal settlements in the distribution of its funds, and that Mr. J. Blair, W.S., their Law Agent, received £1000 for his services in negotiating terms with the Corporations. A good round sum was certainly warranted in the circumstances, as the terms secured, largely through Mr. Blair's influence, were very handsome. All that now requires to be done is to publish in the *Edinburgh Gazette* a certificate by three of the Directors that the Company has been dissolved; and thereafter what was probably the most successful of all the gas companies in the United Kingdom will cease, for all purposes, to exist, and be as if it had never been, except that its fortunate members will continue to receive perpetual annuities of 10 per cent. upon their holdings. The Leith Company was dissolved in the early part of this year.

Notices have this week been published jointly by the Dundee Town Council, Police Commissioners, and Gas Commissioners, and singly by the Aberdeen Corporation, of their intentions to apply to Parliament for power to introduce electric lighting in their localities. In the case of Dundee the application is made jointly, so as to throw upon Parliament the task of determining which of the bodies is the Local Authority under the statutes. They are disposed to have a sort of double-barrelled chance of keeping the electric light supply in their hands, and have resolved to apply as well to the Board of Trade for a Provisional Order. The Committee appointed to look after the Bill met on Thursday, when Mr. Lindsay advocated the adoption of a house-to-house system of supply, but advised that more information should be obtained before deciding. He mentioned, however, that in a Dundee factory the expense of lighting by electricity had been found to be 150 per cent. higher than by gas; and that in a private house, where £22 a year had been spent in gas lighting, electric lighting had cost £47.

The North Berwick Gas Company are proposing, on account of the increase of the town, to extend their works; and the Town Council had the subject under consideration at a special meeting last Monday, when there was some talk, mostly of a purposeless nature, about what was admitted on all hands to be a distant notion—the acquisition of the gas supply. In the end a Committee was appointed to inquire into the subject in all its bearings.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

An upward movement in the price of gas in Scotland has already begun, in consequence of the increased cost of labour, coal, and other materials. The first act in that direction is an announcement by the Falkirk Joint-Stock Gas Company, Limited, to the effect that the Directors have found it necessary to increase the price by 5d. per 1000 cubic feet. On and after Dec. 1, when the next quarter will begin, the increased rate to consumers in Falkirk proper, and in the districts of Grahamstown, Bainsford, and Camelon, will be 3s. 9d. per 1000 feet; and in the Larbert, Stenhousemuir, Carron, and Carronshore districts the price will be raised to 4s. 2d. per 1000 feet. The discounts on all accounts above £20 will be continued as formerly. There is every probability that similar action will also need to be taken by other gas companies, and possibly by one or more gas-supplying corporations in Scotland.

The Glasgow Corporation gas supply undertaking continues to make very decided progress. During the month of September, the quantity of gas made at the three works belonging to the Gas Trust amounted to 201,883,000 cubic feet, as compared with 189,138,000 cubic feet in the corresponding month of last year. These figures show an increase of nearly 6¾ per cent. Then, again, in the month of October, the make amounted to 306,462,000 feet, whereas in the same month of last year the total quantity of gas produced and delivered into the holders was 285,959,000 feet; thus showing an increase for last month amounting to 20,503,000 feet, or considerably over 7 per cent. When mentioning these data as to increased gas consumption, I ought to remark that during September and October last year there was a large consumption of gas going on in the Glasgow International Exhibition. It should also be noted that the use of the electric light in the Glasgow gas supply area is on a much more extensive scale than it was a year ago.

There have already been three big daily consumptions of gas in Glasgow this season, and even during this month. For example, on Wednesday of last week (Nov. 14) the deliveries ran up to a total of 14,407,000 cubic feet, as compared with 13,071,000 feet on the corresponding day of last year—thus showing an increase for the day of 1,336,000 feet. The day specially referred was quite a foggy one. On Monday last the deliveries ran up to 722,000 feet in excess of those of the corresponding day of 1888; but last Monday was not a specially dark day. The consumption for the 24-hour period of yesterday was very large; amounting to 15,666,000 feet, against 13,650,000 feet in the corresponding period of last year. These figures show an increase of upwards of 2 million cubic feet—exactly 2,016,000. For a while in the early part yesterday the atmosphere was very black, though not actually foggy. It is not unlikely that the month of November will show a more decided increase in the gas consumption than either September or October. No mean proportion of the increase is doubtless due to the improved condition of trade generally.

The big holder at the Dawsholm Gas-Works, which Messrs. Clayton, Sons, and Co., Limited, of Leeds, had in hand last spring and summer, putting a third lift on it, is now completed and in regular use. So far as I am aware, this is the only three-lift gasholder yet constructed in Scotland. It is now 90 feet high when completely filled; and I suppose the total capacity of the holder is not much, if at all, under 1¼ million cubic feet. In the event of its working in a satisfactory manner, there is every probability that the other two holders of the same size at these works will also have an additional lift put on them.

I understand that the new retort-house at the Tradeston works of the Glasgow Gas Trust is so far completed that one end of the retort-bench, consisting of 208 retorts (26 ovens), is now in regular use. There are likewise 294 retorts under fire in the old retort-house; making in all 502 retorts.

The air in this part of the kingdom of Scotland has been quite "electrical" during the past week. I have already referred briefly to the parliamentary notice dealing with the electric lighting and other projects of the Partick, Hillhead, and Maryhill Gas Company, concerning which there has been a great amount of talk locally. This week quite a number of electric lighting notices have been published. On Monday, one was issued on behalf of the Town Council of Ayr. At a meeting of that body held this day week, it was unanimously resolved to apply to the Board of Trade for a Provisional Order in order to light the town by electricity. It was calculated that an electric installation for Ayr would cost from £18,000 to £20,000. The expenditure would be considerably more than that of gas, but the light would be greatly superior. At present Ayr has 673 street lamps, which are equal to 14,000 candles. One hundred electric lamps, however, will, it is said, be equal to 120,000 candles. These figures are very "catching;" but the fact of them having been used by the town councillors of "Auld Ayr" shows that men who usually have a fair share of common sense on most other things can easily be led astray. It may be remembered that the gas supply of Ayr is in the hands of the Ayr Gas Company and the Newton-on-Ayr Gas Company, which have their respective areas on the two sides of the River Ayr. The Glasgow Corporation Bill dealing with electric lighting has also been issued this week. It is an "omnibus" Bill, which embraces a number of other matters on which parliamentary authority is sought for. A Board of Trade notice has been published by what is called the Kelvinside Electricity Company, Limited, on whose account powers are sought to cover the district known as Kelvinside, which lies between the burghs of Partick, Hillhead, and Maryhill, and has not hitherto been under any form of municipal government. The scheme promoted by this Company will possibly lead to a sort of triangular duel in which the other antagonists will be the Glasgow Corporation and the Partick, Hillhead, and Maryhill Gas Company. If I mistake not, the whole of the Kelvinside district is supplied with gas by the Glasgow Gas Trust—at least that required for the street lighting. A similar notice has been issued in respect of the burgh of Coatbridge by the Scottish House-to-House Electricity Company. On the part of the same Company, notice has been given to ask for a Provisional Order granting powers for the electric lighting of the city and royal burgh of Glasgow and eight of the suburban burghs north and south of the Clyde. Messrs. Muir, Mavor, and Coulson, Limited, of Glasgow, who have established the only central electric lighting station in Scotland, have likewise taken the necessary steps for procuring a Provisional Order from the Board of Trade. In the event of a compromise being entered into between the firm and the Glasgow Corporation, the latter application may possibly be withdrawn.

The Glasgow pig-iron market has again been excited during most of the week. On Monday, up to 64s. 10½d. was reached for Scotch warrant iron. There was some fluctuation in prices from day to day; and yesterday the closing price had fallen away to 63s. 6d. per ton cash.

The supply of coal is getting more abundant; and prices are somewhat easier.

GAS EXPLOSION AT VAUXHALL.—Last Friday night, shortly after ten o'clock, an explosion of gas occurred at 71, Upper Kennington Lane, Vauxhall, in a building used as a drill-hall. Some visitors were being shown over the building, and the conductor of the party, on entering the sergeants' mess-room, struck a light, when the explosion took place. The windows were blown out; and when assistance arrived it was ascertained that several persons were seriously injured.

MYSTERIOUS OCCURRENCE AT THE LEEDS FORGE.—At the works of Mr. Samson Fox, at Leeds, last Wednesday afternoon, two men, named Tennick and French, were discovered dead in a tool-house, under circumstances which led to the supposition that they had been suffocated by water gas. The bodies were removed to what is known as the band-room; and there, on the following day, a *post-mortem* examination was commenced by Messrs. Hargreaves and Scattergood, surgeons, of Leeds; Mr. A. Scattergood, a son of the latter gentleman, being present. During the course of the examination, young Mr. Scattergood fell to the ground in a fainting condition. The other two gentlemen appeared somewhat affected, and had to leave the building and get into the fresh air as quickly as possible. Mr. Scattergood, jun., had to be conveyed in an ambulance to his home; and the bodies of the two unfortunate men (who were both heavy drinkers) were removed to another place, where the medical investigation will be resumed to-day.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 23.

Sulphate of Ammonia.—The market has been gradually getting firmer, and the tone to-day is very strong. Not only have prompt lots been picked up readily at full rates, but high prices have also been accorded for spring delivery, and this from pretty keen Continental consumers. The fact is, the action taken by the largest nitrate producers to reduce the output (we understand instructions have been cabled out to close the works during December) has created some anxiety among such consumers as have hitherto stood back in the hope of a decline in sulphate during the months of heaviest production, and in the belief that the low price of nitrate would seriously affect the consumption of sulphate. The step taken by the nitrate companies naturally disposes of the latter theory; and, with a hardening nitrate market, consumers begin to fear that sulphate will also advance. The situation, calmly reviewed, does not, however, call for any excitement; the large stocks on this side, and the heavy shipments already made (and which, in spite of the stopping of the nitrate works, will probably not be light in December, as the stocks on the coast will be large enough to complete freight engagements entered into), preclude the idea that there will be any short supply in the present season, while the smaller nitrate works which have as yet not joined in the arrangement will strive their utmost to produce as much as possible, to benefit by the higher prices]which the action of the large companies is expected to bring about. It would appear, therefore, that a great deal more sentiment than common sense is imported into the question of advanced nitrate prices; and the ultimate influence of the latter upon sulphate must meanwhile remain problematical, because there is already so wide a margin between the values of the two commodities. The value of sulphate will depend upon its own natural position. While the present demand lasts, sulphate will be able to hold its own, whatever may be the fate of nitrate; and it would meanwhile be rash to conclude that if nitrate prices were raised £1 per ton, sulphate values would proportionately follow. The closing prices are: Sulphate, £12 2s. 6d. f.o.b. Hull; £12 to £12 1s. 3d. Leith and Liverpool. Nitrate, 8s. 9d. per cwt.

LONDON, *Nov.* 23.

Tar Products.—Important business is reported in pitch, stocks of which are remarkably low, at prices varying from 33s. to 36s. per ton. Benzols are quoted dearer; but very little business is being done at the higher prices asked. The demand for this article appears to have largely increased during the year, notwithstanding the renewed production of the "carbonizers," which is now as great as it ever has been. There are no stocks of it. Anthracene is offered at higher rates, but buyers will not pay the price named below. Carbolic acid is in better odour, notwithstanding the scientific discovery that it can be produced synthetically. Large business in "futures" has been closed during the week. Prices: Tar, 27s. to 33s. per ton, according to position. Benzols (90 per cent.), 3s. 4d. per gallon; (50 per cent.), 2s. 6d. per gallon. Toluol, 1s. 7d. per gallon. Solvent naphtha, 1s. 8d. per gallon. Crude naphtha, 1s. 3d. per gallon. Light oil, 4½d. per gallon. Creosote, 2½d. per gallon. Carbolic acid, 3s. 4½d. per gallon. Cresylic acid, 10d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 2d. per unit; "B" quality, 1s. 1d. per unit.

Ammonia Products.—There is great activity in caustic ammonia, which has now become a larger market. Carbonate is in better demand, and for best qualities 3¾d. per lb. is asked; but shipments of sulphate have been small, and no new business has been noted. Nominally it is quoted at £11 15s. to £12 per ton. Other prices are: Gas liquor (5° Twaddel), 7s. to 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¼d. per lb. Muriate of ammonia, brown, £20 per ton; white, £28 per ton. Sal-ammoniac, £34 to £35 per ton.

DARLINGTON AND THE ELECTRIC LIGHT.—The Darlington Town Council, sitting as the Urban Sanitary Authority, last Tuesday decided to make application for a Provisional Order, empowering them to supply electricity for public and private purposes in the borough.

SALES OF SHARES.—During the past week, 81 £5 shares in the *Brompton, Chatham, &c., Water-Works Company* were sold at from £15 10s. to £16 per share. Two small lots of £5 shares in the *Rainham Water-Works Company* also changed hands at prices ranging from £7 10s. to £8 5s. per share.

THE ELECTRIC LIGHT AT KESWICK.—According to a local paper, Keswick is soon to enjoy the "many advantages" which the electric light is said to possess over gas. A company was formed some six months ago with a nominal capital of £5000, in shares of £1 each; and contracts for the necessary buildings and plant were at once entered into, and by Christmas it is anticipated the Company will be able to supply the current for the light. It is estimated that the cost will be about 3s. 6d., as compared with gas at 4s. 3d. per 1000 cubic feet; and this figure has induced a "good number of mansions, large hotels, and many tradesmen," to signify their intention of becoming users of the light. The Company (our contemporary states) are highly satisfied with their present prospects, and have every confidence that the undertaking will be a success.

BUXTON LOCAL BOARD GAS SUPPLY.—At the last meeting of the Buxton Local Board, the Gas Manager (Mr. G. B. Smedley) reported that the quantity of gas produced in the quarter ending Sept. 25 last was 11,680,900 cubic feet. The amount supplied by meter was 10,069,800 cubic feet; that used for the public lighting, 757,600 cubic feet; that consumed in the shops, works, &c., 172,700 cubic feet—making a total of 11,000,100 cubic feet, and leaving 680,800 cubic feet unaccounted for. The coal and cannel carbonized amounted to 1105 tons 12 cwt. The cost of gas into the holders, after deducting the value of the residuals, was 10·332d. per 1000 cubic feet. Comparing these figures with those for the corresponding quarter of last year, there has been an increase of 1,384,000 cubic feet in the quantity of gas produced, and of 1,113,400 cubic feet in that distributed. The cash entered in the rental was £1678; estimated for lamps, £114—total, £1792.

THE NORTHERN COAL TRADE.—There has been a falling off in the inquiry for steam coal in the past few days, as is usual at this time of the year; but the demand for all other classes is still heavy. For best Northumbrian coals about 10s. 6d. is the price; but in one or two cases a rather higher figure is spoken of. Second qualities are proportionately lower; and small steam coals are in good request at from 5s. 6d. to 6s. per ton, free on board in the river. For gas coals the demand is now at its largest; and as there are fewer interruptions by strikes, the output is good, with a better supply to those who have contracted. The latter are fortunate, for in some cases they are getting best gas coals at 6s. per ton free on board, whilst the current price for uncontracted coal is from 11s. to 11s. 6d. per ton, free on board. Contracts that are now being made show advanced rates. Should the production of gas coals keep unchecked, about a month will see the season past its best, as far as the home demand is concerned. Coke is very firm, at high prices; and gas coke is also selling well.

THE PROPOSED NEW WATER-WORKS FOR BAILDON.—The Baildon Local Board held a special meeting last Saturday week, and formally agreed to make application to Parliament for authority to take water from Hawksworth and Bingley Moors, and to construct a reservoir. Some particulars relating to this scheme were given in our last issue (p. 981).

SALE OF SHARES IN THE MITCHAM AND WIMBLEDON GAS COMPANY.—Last Thursday, at the Vestry Hall, Lower Tooting, 252 shares of all classes, in the Mitcham and Wimbledon Gas Company, were offered for sale by public auction. The first batch (divided into 11 lots) comprised 44 £10 fully-paid shares of the first issue, upon which 10 per cent. has been paid. The prices realized were from £22 to £23 per share. The next batch (divided into 12 lots) included 48 £10 fully-paid shares of the second issue, upon which interest at the same rate has been paid. The prices ranged from £23 to £24 per share. The third batch of 80 shares (divided into 16 lots) included £10 shares of the third issue, also bearing interest at 10 per cent., with only £4 called up. These shares sold at £10 per share. The last batch (divided into 16 lots) included 80 £10 shares, bearing 7 per cent. interest, with only £2 called up; the sale realizing at from £4 to £4 2s. 6d. per share, Several £50 mortgage debenture bonds, bearing interest at 4 per cent., were disposed of at prices varying from £50 5s. to £50 7s. 6d. per bond.

PORTSMOUTH WATER COMPANY.—The report which was presented by the Directors to the shareholders of this Company at their meeting last Thursday, stated that the expenditure on captial account during the past half year was £6293, the greater part of which was spent in completing the works for the new pumping-station at the Bedhampton Springs. During the six months, 3069 yards of additional water-mains were laid, making the total length of mains of various sizes 133 miles. The number of additional house services laid on was 664; making the total number of premises now supplied by the Company in all their districts 32,837. The average daily supply of water for all purposes was 5,287,000 gallons, as against an average of 5,457,000 gallons during the corresponding half of last year, or a decrease of 170,000 gallons per day, notwithstanding the increase in the number of services. Turning to the accounts, the revenue from all sources during the period covered by the report was £22,711, and the expenditure £7488; leaving a balance of £15,223 to be carried to the credit of profit and loss. The balance available for dividend was £16,262, subject, of course, to the usual deductions. The report was adopted; and the shareholders declared, on the Directors' recommendation, the full statutory dividends of 10 per cent., and 7 per cent. on the respective classes of shares.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 1006.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	12¾—13¼	..	5 11 1
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	110—112	..	4 9 9
100,000	20	30 May	8†	Bahia, Limited	20	20—22	–3/4	7 5 5
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾—7¼*	..	5 8 5
40,000	5	,,	7½	Do. New	4	4¾—5¼*	..	5 17 10
880,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	220—225	–5	5 8 10
125,000	,,	,,	9½	Do. New	100	162—167	..	5 10 9
320,000	20	12 Sept.	11	Brighton & Hove, Original	20	42—44	..	5 0 0
320,000	20	27 Sept.	11½	British	20	44—46	..	4 14 1
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	–1	5 4 9
89,000	10	,,	8	Do. 7 p. c.	10	13—15	–2	5 6 8
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	13—14*	–¼	7 2 10
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13½	Commercial, Old Stock	100	243—245	–7½	5 12 3
130,000	,,	,,	10½	Do. New do.	100	200—205	–5	5 4 10
130,000	,,	28 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	–2	3 12 7
557,320	20	14 June	13	Continental Union, Limited	20	48—49	..	5 6 2
242,680	20	,,	13	Do. New '69 & '72	14	33—35	..	5 4 0
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	26 July	13	European, Limited	10	22—24	–1	5 8 4
120,000	10	,,	13	Do. New.	7½	17—18	..	5 8 4
354,060	10	,,	13	Do. do.	5	11—12	–¼	5 8 4
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	239—244	–4	5 12 9
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—106	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	–3	3 18 5
80,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,800,000	,,	,,	7	Do. H, 7 p. c. max.	100	157—162	–1	4 6 5
468,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	248—253	–2	3 19 0
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	116—121	–1½	3 6 1
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123—128	–2	3 10 3
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170	–4½	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	205—210*	–9½	5 14 3
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115	..	4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	19½—20½	–½	5 17 1
150,000	5	30 May	10	Oriental, Limited	5	8¾—9¼	..	5 8 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5¾—6¼	..	5 12 0
166,870	10	26 July	4	Pará, Limited	10	4—5	..	8 0 0
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	100—106	..	5 14 8
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
100,000	10	16 Oct.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	295—305	–5	5 6 6
1,850,000	,,	,,	12½	Do. B do.	100	220—225	–2½	5 7 9
141,500	,,	,,	13½	Do. C do.	100	240—250	..	5 6 0
600,000	,,	28 June	5	Do. 5 p. c. Deb. Stk.	100	138—142	..	3 10 5
60,000	5	12 Sept.	11½	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 8 5
						*Ex div.		
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	265—271	..	3 10 1
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	213—217	..	3 9 1
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	14 June	9	Grand Junction	50	128—132	..	3 8 2
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9½†	Lambeth, 10 p. c. max.	100	257—262	..	3 12 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	119—122	..	3 5 7
500,000	100	14 Aug.	12½	New River, New Shares	100	363—368	..	3 5 10
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,800	Stck.	28 June	6	S'thwk & V'xhall. 10 p.c. max.	100	170—175	..	3 8 6
1,126,500	100	,,	6	Do. 7½ p. c. do.	100	168—173	..	3 9 4
155,066	Stck.	14 June	10	West Middlesex	100	265—270	..	3 14 1

† Next dividend will be at this rate.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

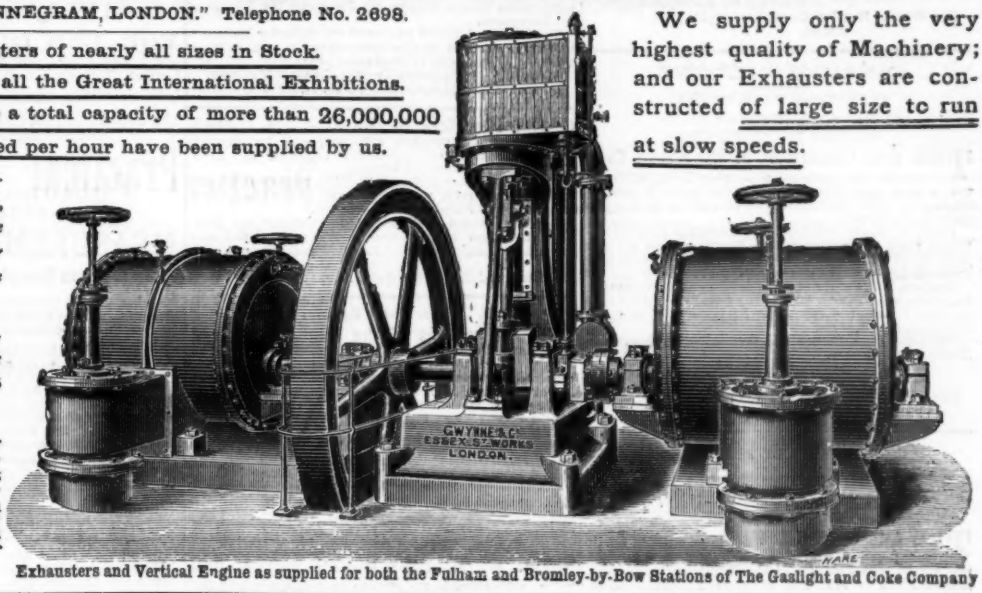
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / No. 64, BERNARD STREET, LEITH, } SCOTLAND.

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

WANTED, by a competent Man a Situation as SERVICE LAYER, METER FIXER, INDEX READER, &c. Eleven years in last situation.
Address A. B., 16, Station Street, STRATFORD, E.

WANTED, by a young Man, a Situation as GAS-FITTER and STOVE and METER FIXER; accustomed to General Work. Good References.
Address W. M., 3, St. George's Place, Mortlake Road, Richmond, SURREY.

DRAUGHTSMAN WANTED.

DRAUGHTSMAN wanted for a Suburban Gas Company. Must have experience in details of Gas Plant.
Apply, stating qualifications, to No. 1767, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Manager, used to Clay Retort Setting, Exhaust, &c., wanted for the Brecon Gas-Works. Make 20 millions. Wages to commence, 35s. per week, with House, Coals, and Gas.
Applications, with three recent testimonials, to be sent in on or before the 1st of December to EDWIN A. WRIGHT, SECRETARY.

WANTED, six Railway Tank-Wagons, (each holding about 2000 gallons), to Hire, with view to purchase.
State full particulars in detail to No. 1761, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.
Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 1039 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice.
Address P. J. DAVIES, 78, Earl's Court Road, Kensington, LONDON.

SHIPPING AND INSURANCE.

FOR Rates of Freight, &c., apply to ROBERT BRUCE FITZMAURICE, 9, Crosby Square, LONDON, E.C.

WANTED, to purchase Gas Carbon, delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One Single Gasholder, 80 feet by 20 feet (owing to extensions at Blackpool). To be erected complete; in first-rate condition.
Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

TO GAS-WORKS LESSEES, ETC.

TO BE LET, for Three years or more, the NANTLLE VALE GAS-WORKS, vacant through the death of the Lessee. One man may do the whole work.
Tenders to be sent before Dec. 6.
Further particulars from the Secretary, EDWARD JONES, Bryntêg, TALYSARN, N.W.

OLDBURY LOCAL BOARD.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of 200 to 300 tons of CANNEL COAL.
Tenders, endorsed "Cannel Tender," to be sent in, not later than Tuesday, Dec. 3, to the undersigned, from whom any further information may be obtained.
By order,
C. MEIKLEJOHN, Manager.
Nov. 22, 1889.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys.*
Highest References and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt. Delivered in carboys or railway tank waggons.
For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street, LONDON.

THE Corporation of Middlesbrough are prepared to receive TENDERS for about 180 tons of SPENT OXIDE. Samples will be sent on application to the Gas Manager (E. D. Latham, C.E.)
The Corporation do not bind themselves to accept the highest or any tender.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Sleaford Gas Com- pany, Limited, are prepared to receive TENDERS for their surplus TAR and AMMONIACAL LIQUOR produced at their Works during the year 1890.
The Tar and Liquor will be loaded into Tank-Wagons at Sleaford Station.
For further particulars apply, to HARRY WIMHURST, Manager, Gas-Works, SLEAFORD.

TO WELL SINKERS AND OTHERS.

THE Streets Committee of the Commis- sioners of Sewers of the City of London will meet in the Guildhall of the said City on Friday, the 29th of November, 1889, at Two o'clock precisely, to receive TENDERS for completing an ARTESIAN WELL at New Street, Gravel Lane, in the City of London, agreeably to Specification and general Conditions, which may be obtained at the Office of the Engineer to the Commissioners in the Guildhall, on payment of one guinea, to be returned on receipt of a *bonâ fide* tender.
Security will be required for the due execution of the Work.
The Commissioners do not pledge themselves to accept the lowest or any tender.
All tenders must be delivered in before Two o'clock on the said day; and parties sending in proposals must attend personally, or by a duly authorised agent.
HENRY BLAKE, Principal Clerk.
Sewers' Office, Guildhall, Nov. 12, 1889.

TENDERS FOR GAS LIQUOR.

THE Ascot and District Gas Company are prepared to receive TENDERS for the purchase of the GAS LIQUOR produced at their Works from Jan. 1 to Dec. 31, 1890.

Further particulars may be had on application.

WILLIAM G. HICKS, Manager.

Gas-Works, Bagshot Road, Sunninghill, Berks.

CORPORATION OF LEICESTER.

AYLESTONE ROAD WORKS.

SECTION No. 2.—CONTRACT No. 24.

RETORT MOUTHPIECES.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply and delivery of 256 CAST-IRON SELF-SEALING RETORT MOUTHPIECES at their Aylestone Road Works.

Form of tender and further particulars may be obtained upon application to the Engineer, and on the payment of a sum of £5, which amount will be returned upon receipt of a *bond fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Mouthpieces," to be delivered at these Offices, not later than Eleven o'clock a.m., on Saturday, Dec. 7, prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M. Inst. C.E., Engineer and Manager.

Gas Offices, Millstone Lane, Leicester, Nov. 23, 1889.

CORPORATION OF LEICESTER.

AYLESTONE ROAD WORKS.

SECTION No. 2.—CONTRACT No. 25.

STATION METER.

THE Gas Committee of tue above Corporation are prepared to receive TENDERS for the supply and erection of One 80,000 cubic feet per hour STATION METER at their Aylestone Road Works. Foundations will be provided by the Gas Committee.

Form of tender and further particulars may be obtained upon application to the Engineer, and on the payment of a sum of £5, which amount will be returned upon receipt of a *bond fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Station Meter," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 7, prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M. Inst. C.E., Engineer and Manager.

Gas Offices, Millstone Lane, Leicester, Nov. 23, 1889.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

THE Directors of the Sheffield United Gaslight Company are prepared to receive TENDERS for two LANCASHIRE STEEL BOILERS, each 30 feet long by 7 ft. 6 in. diameter; to be delivered and fixed at their Grimesthorpe Chemical Works.

Forms of Tender, with specification and drawing, may be obtained, on payment of half-a-guinea, upon application to the Company's Engineer, Mr. Fletcher W. Stevenson.

Tenders, sealed and endorsed "Tender for Boilers," must be delivered to the undersigned not later than Tuesday, the 3rd day of December next.

HANBURY THOMAS, General Manager.

Commercial Street, Sheffield, Nov. 14, 1889.

THE Directors of the Sheffield United Gaslight Company are prepared to receive TENDERS for CONDENSERS required at their Grimesthorpe Chemical Works.

Forms of tender with specification may be obtained, and drawings seen, upon application to the Company's Engineer, Mr. Fletcher W. Stevenson.

Tenders, sealed and endorsed "Tender for Condensers," must be delivered to the undersigned not later than Tuesday, the 3rd day of December next.

HANBURY THOMAS, General Manager.

Commercial Street, Sheffield, Nov. 14, 1889.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for repairs at their Neepsend and Effingham Street Stations during the next twelve months.

Specifications and forms of tender may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

Tenders, marked "Tender for Fire-Clay Goods," must be delivered to the undersigned not later than Tuesday, Dec. 3, 1889.

HANBURY THOMAS, General Manager.

Commercial Street, Sheffield, Nov. 14, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Price One Guinea. Fcap. folio, scarlet cloth.

Plans and Description of the Extensions

AT THE

WINDSOR STREET GAS-WORKS OF THE BIRMINGHAM CORPORATION,

DESIGNED AND CARRIED OUT BY

CHARLES HUNT, M. Inst. C. E.

London: WALTER KING, 11, Bolt Court, FLEET ST., E.C.

Limp Cloth; price 2s., free by post.

TABLES

OF

Gas Values, Discounts, Dividends, and Weights and Measures,

FOR USE IN GAS OFFICES.

London: WALTER KING, 11, Bolt Court, FLEET ST., E.C.

Now Ready, Fcap. 4to, Cloth, Gilt Lettered, with numerous Illustrations, price 7s. 6d., post free.

Practical Photometry:

A GUIDE TO THE STUDY OF THE

MEASUREMENT OF LIGHT.

By William Joseph Dibdin, F.I.C., F.C.S.,

Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

Chemist and Superintending Gas Examiner to the London County Council.

The aim of the Author has been to give a comprehensive account of the various methods of Photometry in daily use, and to make the book thoroughly practical by indicating the many precautions necessary for ensuring accurate results in photometrical work. The volume contains chapters on the History and Principles of Photometry; Horizontal, Radial, and Jet Photometers; Standards of Light; the Proposed Substitute for Candles; the Auxiliary Apparatus required in Testing Gas; the Examination and Adjustment of a Gas-Testing Photometer; and Colour and Stellar Photometry; together with an Appendix comprising the Notification of the Metropolitan Gas Referees, Tables for the Correction of Volume of Gas and Observations of Candles, and other matter useful to Photometrists.

London: WALTER KING, 11, Bolt Court, FLEET ST., E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

COKE BREAKERS,

FROM £14 EACH.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

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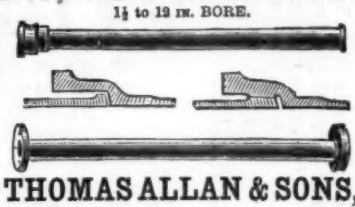

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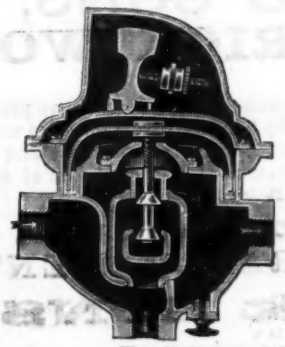

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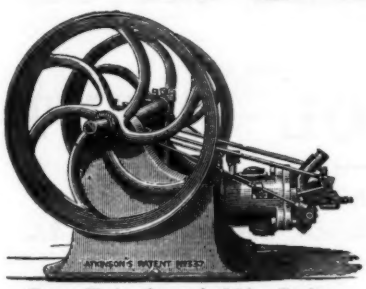

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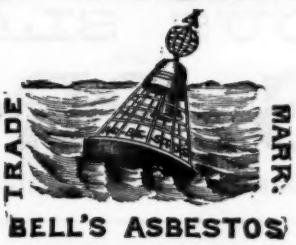

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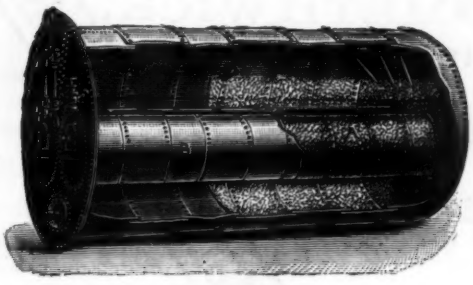

A shows Boiler Plates when incrusted.
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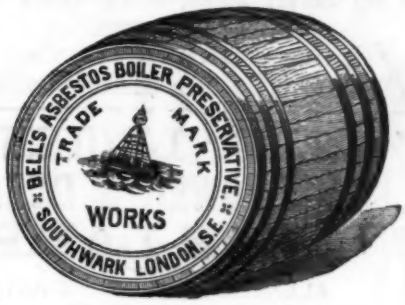

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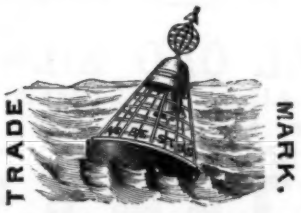

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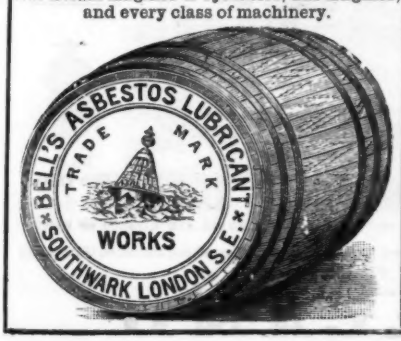

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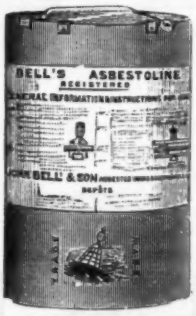

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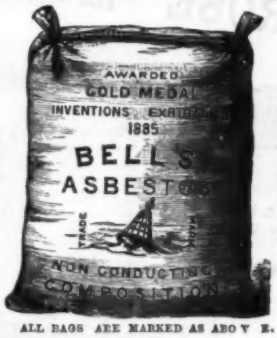
Is superior to any other, and saves its cost in a few months.



Can be applied again after many years' service. Is sent out dry in bags: therefore cheaper than others sent on wet.

ALL BAGS ARE MARKED AS ABOVE.

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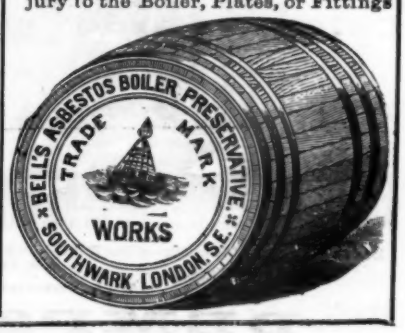
BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings



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GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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THE "LUCIENT" HIGH-POWER & DURABLE GAS-LAMP.

ALEXANDER BROWN'S PATENT.

Gives the most intense, brilliant, and steady white light yet produced from gas. A light of over 270 candles for 13 cubic feet per hour. Such results are unapproached by any other Regenerative Gas-Lamp. To be seen in operation, and full particulars obtained of

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First Silver Medal—Highest Award—at the Annual Exhibition of the Royal Cornwall Polytechnic Society, held at Falmouth, Sept. 10 to 14, 1889.

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Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

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ESTABLISHED 1855.

ROSE MOUNT GAS ENGINEERING WORKS,

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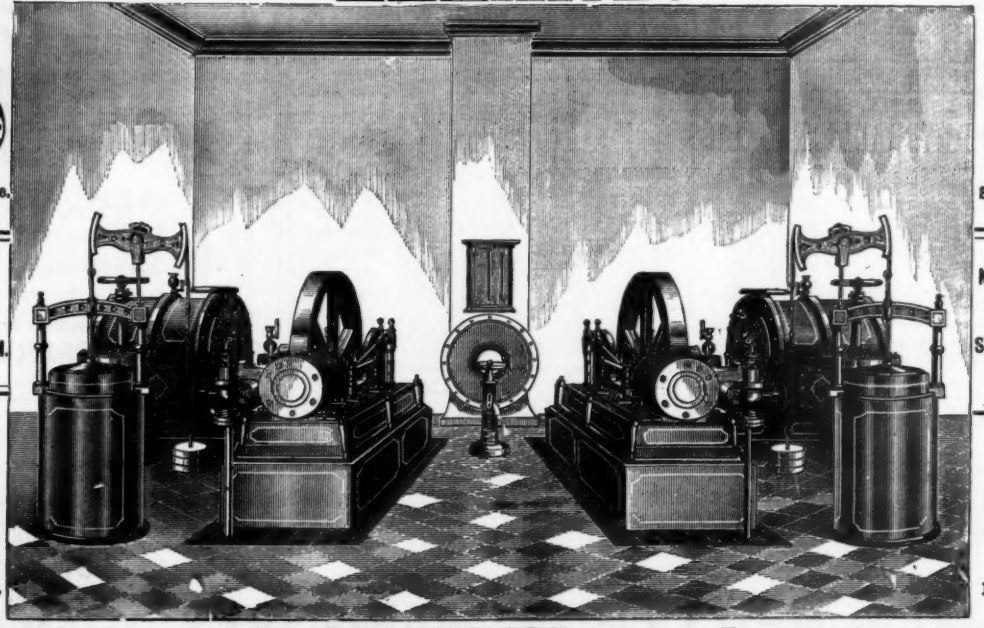
No. 1. Flange Valve.



No. 5. Screw Valve.

NO SLIP.

NO OSCILLATION.

NO HIGH SPEED.

STEADY GAUGE.

No. 3. Screw Valve.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 60,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

DEMPSTERS', ELLAND.

WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

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ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

W. C. HOLMES & CO.,

CONTRACTING GAS ENGINEERS.

SPECIALITIES.

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Patent Reciprocating Exhauster.

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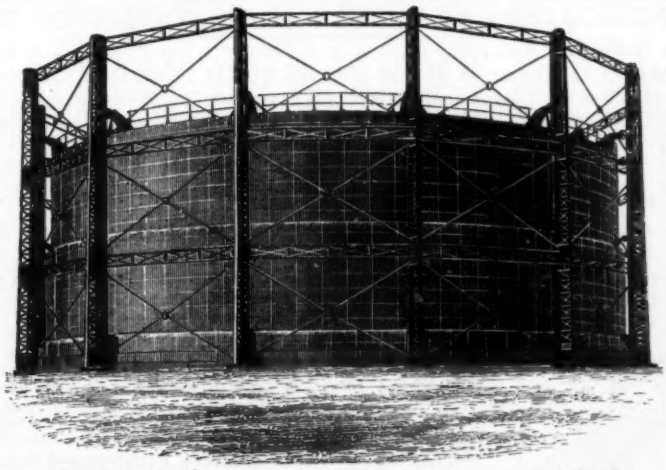

Treble-Lift Gasholder, 130 ft. by 60 ft., as erected at Burton-on-Trent.

SOLE MAKERS OF

DRAKE'S PATENT

GAS PLANT

Specially adapted for Country Places, and for mixing with Coal Gas to increase Illuminating Power.

Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

IMPROVED CHEMICAL PLANT.

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A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

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MAKERS OF

CAST-IRON PIPES FOR GAS, WATER, AND STEAM.

ALSO

Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

WEST'S GAS IMPROVEMENT CO., LIMITED,

Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER 160 MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE** per Ton of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by Wire Rope, Steam, or Compressed Air.—The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of **CIRCULAR, OVAL,** or Ω-shaped **MOUTHPIECES,** with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

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ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

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